

APHIDIDÆ OF SOUTHERN CALIFORNIA VIII

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Southern California with its varied flora and mild climate affords an excellent place for the collecting and studying of Plant Lice (Aphididæ). At first the field seemed unfavorable, especially was this impressed upon me during the first two years of my work on this family. This is accounted for, in a great measure, by lack of experience in field collecting and in close observation. Then too, the first operations were carried on in a much drier region than is usually found nearer the coast. In Ventura County, and particularly in the vicinity of Santa Paula, I have been able to take a great number of new species and even a few new genera, and all of this is practically the work of a single spring and summer. No doubt the same is true throughout a great part of the State and especially further south, the entire field being practically new. In fact I know of only one new species being reported south of Los Angeles and that by Prof. Cockerell, who described *Aphis tetrapteralis* Ckll. taken on *Atriplex canescens tetraptera* at La Jolla. (Bull. So. Calif. Acad. Sci., I, No. 4, April 1, 1902). From some ten species received from Imperial County this summer, only four were known to me, but the material received was in such poor condition that a careful study could not be made, so as to warrant descriptions of new species.

As stated, further on, several of the new species and two of the genera are close links between other species and genera already described.

I wish to acknowledge, here, the special and most valuable aid of my brothers, S. H. Essig and F. M. Essig, in collecting and in discovering many of these most interesting forms.

PEMPHIGUS Hartig.

Type *Aphis bursarius* Linn.

Key to California Species

1. Not a gall-forming species; subterranean, or partially so, in habits. 2
Forming galls, pseudogalls, or curling the leaves; distinctly aerial in habits. 3
2. Transverse sensoria only on antennal articles III and IV, distinctly subterranean. *betæ*
Transverse sensoria on articles III, IV and V; only partially subterranean in habits. *californicus*
3. Forming distinct galls. 4
Forming pseudogalls or simply curling the leaves. 6
4. Forming large, singular galls on the petioles near the bases of the leaves; large numbers in each gall. 5
Forming many moniliform galls on the surfaces of the leaves, a single individual in each gall. *populimonilis*
5. Galls globular in form, antennæ rough with transverse sensoria on antennal articles III, IV, V and VI. *populicaulis*

Galls elongate oval, antennae smooth without distinct transverse sensoria.

6. Forming pseudogalls causing the upper surfaces of the leaves to fold together along the mid-ribs; antennal articles III, IV, V and VI with transverse sensoria, spur or unguis with constricted neck.

populiconduplifolius

Curling the leaves or on the younger stems close to the ground; transverse sensoria only on articles III and IV, unguis without constricted neck.

fraxini-dipetalae

P. betae Doane. On common beet (*Beta vulgaris* L.). First reported by Clarke on Beet, Red Dock, and Canaigre (*Rumex hymenosepalus*), from Berkeley, Placer County, and Palo Alto, California. Can. Ent. XXXV, p. 248, 1903. Davidson reports it from Palo Alto on Dock (*Rumex occidentalis*). Jr. Ec. Ent., III, p. 372, 1910.

P. californicus Davidson. First taken on *Ranunculus californicus* Benth at Palo Alto, California, by Davidson. Jr. Ec. Ent., III, p. 373, 1910. Later taken by the writer on the same plant near Nordhoff, California. Originally described as *P. ranunculi* Davidson, but renamed *P. californicus* by same author. Jr. Ec. Ent. IV, p. 414, 1911.

P. populimonilis Riley. "Abundant in Tulare County on *Populus fremonti* during the summer months at least." Davidson, Jr. Ec. Ent., III, p. 374, 1910. Also abundant on *Populus trichocarpa* T. & G. at Santa Paula, California, (see description). Also taken by Davidson in Placer County, California. P. C. Jr. Ent. III, p. 398, 1911.

P. populicaulis Fitch. On *Populus trichocarpa* T. & G. at Palo Alto, California. Davidson, Jr. Ed. Ent. II, p. 299, 1909. Also taken in large numbers on the same host at Santa Paula, California (see description).

P. populitransversus Riley. Abundant on *Populus trichocarpa* T. & G. at Palo Alto, California. Davidson, Jr. Ec. Ent. III, p. 372, 1910. Also taken by same authority in Placer County, California, on *Populus fremonti* Wats. P. C. Jr. Ent. III, p. 398, 1911.

P. populiconduplifolius Cowen. Occurring on *Populus trichocarpa* T. & G., in April. Palo Alto, California. Davidson, Jr. Ec. Ent. III, p. 374, 1910.

P. fraxini-dipetalae Essig. Quite abundant on Mountain Ash (*Fraxinus dipetala*) in the mountains near Santa Paula, California. P. C. Pr. Ent. III, pp. 353-356, 1911.

TRIFIDAPHIS Del. Guercio.

Type *Pemphigus radiccicola* Essig

T. radiccicola (Essig) Del Guercio. First taken by the writer at Claremont, California, where it occurred on the roots of *Amaranthus retroflexus* L. (Pigweed) and *Solanum douglasii* Dunl. (Nightshade). P. C. Jr. Ent. I, pp. 8-10, 1909. Taken also at Oxnard, California, on roots of Nightshade. At Santa Paula, it is frequently found on the roots of Nightshade, Pigweed, and on Potatoes and garden Beets (always underground).

Bibliography

- 1909 *Pemphigus radicolica* Essig, P. C. Jr. Ent., L, pp. 8-10, original description.
- 1909 *Trifidaphis radicolica* (Essig) Del Guercio, Rivista di Patal. Vegetale, Anno, III, p. 332. Placed in new genus.
- 1909 *T. radicolica* Essig Del Guercio-Baker, P. C. Jr. Ent., L, pp. 73-75. Translation of Del Guercio's article.
- 1910 *T. radicolica* Essig Del Guercio-Wilson, Ent. News, XXI, p. 155. List of Genera.
- 1910 *T. radicolica* Essig Del Guercio-Essig, P. C. Jr. Ent., II, pp. 283-285. Wing variations.
- 1911 *T. radicolica* Essig Del Guercio-Essig, P. C. Jr. Ent., pp. 141-152. Host plants and synonymy.

Pemphigus californicus Davidson

(The Woolly Plant Louse of the Buttercup)

- 1910 *Pemphigus ranunculii* Davidson, Jr. Ec. Ent. III, pp. 372-373. Original description.
- 1911 *Pemphigus californicus* Davidson, Jr. Ec. Ent. IV, p. 414. Renamed.

WINGED VIVIPAROUS FEMALE (Figure 223 A)

Length of body without flocculence 2.6 mm., width of mesothorax 0.9 mm., width of abdomen 1.1 mm., wing expansion 6.7 mm. *Body*—Covered with a long white or bluish-white flocculence. Naked body of the typical *Pemphigus* shape, thorax little wider than abdomen. *Prevailing color*—With the flocculence white and black, without flocculence, black head, and thorax and dull green abdomen with brown appendages. *Head*—Broad base and well rounded in front between the antennae, much wider than long, with two compound and three ocellar eyes, black. *Eyes*—Compound eyes very dark red with a marginal terete tubercle on the after part; this tubercle is composed of two small ocelli (Figure 223, 2). This is the only instance of this kind I have ever noticed and a character not mentioned by Davidson in his description. *Antennae*—(Figure 223 C, E, F). Arising from near the sides of the head, bases widely distant, reaching to second abdominal segment; usually dark throughout; three apical articles with lighter bases, all light at articulations, apical half imbricated, with very few short hairs; article lengths as follows: I, 0.12 mm.; II, 0.12 mm.; III, 0.45 mm.; IV, 0.19 mm.; V, 0.25 mm.; VI, 0.21 mm. (unguis or spur 0.03 mm.); total 1.34 mm. Articles I and II usually coequal, III longest, nearly as long as IV and V together and longer than IV and VI together, IV shorter than VI, V longer than either IV or VI, and more than twice as long as either I or II, VI, with base approximately six times as long as the unguis. Articles traversed by numerous long transverse sensoria which are very unevenly distributed. III has from nineteen to twenty-five, more often with twenty-one; IV, four to eight. In examining eight articles there were to be found one with four, one with five, two with six, three with seven and one with eight; article V, with from one to four, three and

four being most common; VI has usually the ordinary sensoria in the process, which may consist of three. *Rostrum*—Reaches to third coxæ, light yellow with dusky base and extreme tip dark. *Prothorax*—Smooth, wider than the head, but very short, black or very dark green, without tubercles. *Meso- and Meta-thorax*—Muscle lobes well developed, dark brown to black, ventral surface green between coxæ. *Abdomen*—Well rounded and distinctly segmented, dull green in living specimens, but turning orange or yellow shortly after mounting, with four rows of large, nearly circular, wax areas which differ little, in color, from the body and which are difficult to see in fresh specimens; for this reason they are not indicated in the drawing. The four glands or wax areas occupy nearly an entire abdominal segment, and each is filled with fine pores. In the living forms the abdomen is covered with a thick coating of long flocculence, while there is little or none on the head and thorax of the winged forms. There are to be noticed dark spots along the lateral sides of the abdomen in cleared specimens only, these being located at the union of the segments. Anal plate, well rounded, dark. *Cornicles*—Wanting. *Legs*—Normal, dark, rich brown, with very few hairs. In fresh specimens the coxæ are dark, femora, tibiæ, and tarsi greenish brown. Article I of the tarsus (Figure 223 G) is very short and triangular, the second article long with the upper end extending to the tibia, nearly seven times as long as I. *Wings*—Dusky hyaline throughout, normal in size. *Primary*—Length 2 mm., width 1 mm. Venation normal for this genus. Costal vein widest at base and narrowing to the stigma, dark brown. Subcostal much wider than the costal, dark brown. Stigma short, bluntly pointed at the end, nearly three times as long as broad, dark brown, with the lower margin darkest, with the entire shading somewhat mottled, lower margin with a row of short curved hairs. Stigmal vein arising from the stigma slightly beyond the middle, curved throughout the basal one-third, may or may not be slightly undulate, rather long, wider at base. First and second discoidals with bases close together, and arising near the middle of the subcostal, slightly curved with the convex surface towards the tip of the wing, diverging from bases to tips, which are far apart (the tip of the second discoidal is midway between the tips of the first and third discoidals. Second discoidal with much deeper bend than has the first. Third discoidal obsolete for a considerable part of the base, the basal tip being nearly even with the middle point of the second discoidal and midway between it and the lower margin of the stigma, straight, slightly curved downward, or undulate, tip reaching the wing margin slightly nearer the tip of the stigmal vein than midway between the tips of the stigmal vein and the second discoidal. All veins yellowish to amber. *Secondary*—Length 2 mm., width 0.6 mm. Subcostal vein strongly bent downward at the bases of the discoidals, one-third the distance from its base to tip. Discoidals with bases close together. First discoidal short, slightly undulate. Second discoidal much longer than the first, nearly in a line with a continuation of the subcostal before it bends, well curved, with convex surface upwards. All veins yellowish. *Style*—(Figure 223, I). Tubercle-shaped, with base nearly twice as wide as the length, green or dusky brown, does not project beyond the last abdominal segment or the anal plate.

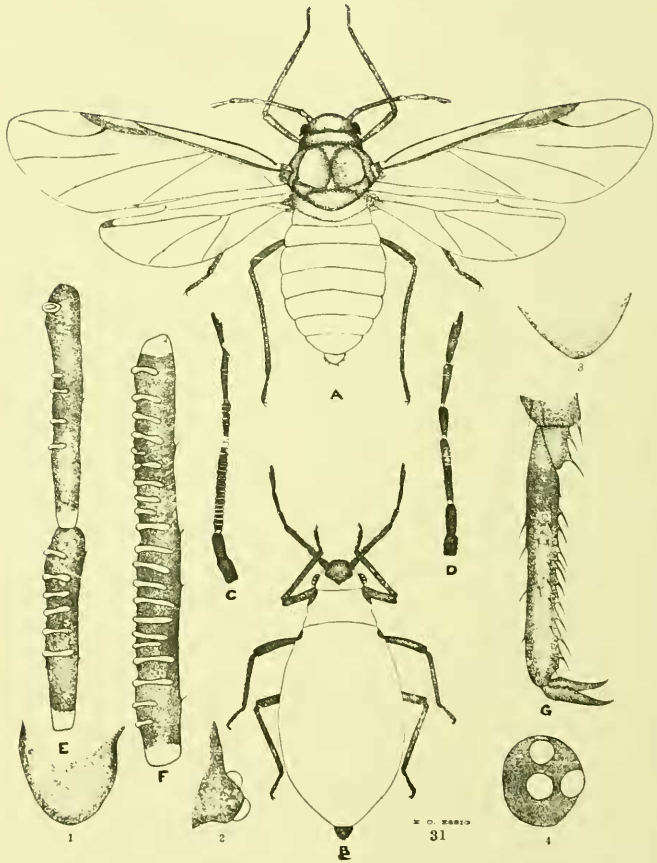


Figure 223. *Pemphigus californicus* Davidson

APTEROUS VIVIPAROUS FEMALE (Figure 223 B)

Length of naked body 2.9 mm., width 1.3 mm. When covered with the long flocculence the measurements are nearly twice as great. *Body*—Entirely covered with long white or bluish-white flocculence. *Prevailing color*—Naked body of living specimens dull green, of mounted specimens rich yellow. *Head*—Light green with median brown spot on the frontal between the antennae, somewhat triangular in shape with base widest and the front straight, but narrow. *Eyes*—Each composed of a group of three ocelli which resemble a compound eye, the background of which is red (Figure 223, 1). *Antennae*—(Figure 223 D3). Reaching nearly to the middle of the abdomen, slightly imbricated, with very few hairs, brown throughout with articulations lighter, (in mounted specimens they appear brown or even amber). Lengths of articles: I, 0.11 mm.; II, 0.15 mm.; III, 0.32 mm.; IV, 0.17 mm.; V, 0.22 mm.; VI, 0.24 mm. (spur 0.04 mm.); total 1.21 mm. Article II is usually longer than I in the apterous form, being nearly a fourth longer; III is the longest, being more than twice as long as II, and nearly three times as long as I, but not twice as long as IV, though very nearly so; IV is shorter than III, V or VI; V is much longer than IV and nearly as long as VI. The spur or unguis of the apterous female composes about one-sixth of the article. *Sensoria* at the apical end of V and in the process of VI. *Rostrum*—Reaches to or slightly beyond the third coxae, light green or yellow, with brown base and tip. *Prothorax*—Green with a brown marginal spot on the front side, little wider than the head. *Mesothorax*—With a similar brown spot on each front margin. Entire thorax otherwise green. *Abdomen*—Smooth, light green. Entire body traversed by four longitudinal rows of large oval glandular spots, which are concolorous with the body. These occupy nearly all of each abdominal segment on the dorsum. Anal plate sometimes projecting beyond tip of abdomen, brown. *Cornicles*—Wanting. *Legs*—As in the winged form. *Style*—(Figure 223, 3). Blunted, base much wider than the length, brown.

Young—Covered with the long white flocculence from a very early stage, a few may be seen to be naked. The body is a pale light green.

Host—This insect feeds on the California Wild Buttercup (*Ranunculus californicus* Benth) and collects in great numbers on the stems, at or slightly below the surface of the ground. In a few cases individuals were observed feeding on the stems a few inches above ground and on the undersides of the older leaves which lay on the ground. They are usually grouped in quite large colonies which are easily recognized by the large surplus of the white flocculence which has been rubbed from various individuals. As soon as disturbed each insect immediately lets go its hold and seeks shelter among the particles of earth or leaves. Small, white, elongated eggs were also observed on various parts of the stems.

Locality—Collected by the writer on a small hill where the buttercups were growing plentifully under the shade of the live oak trees, near Nordhoff, Cal., at an altitude of 450 feet. W. M. Davidson has collected this insect in the vicinity of Stanford University, Palo Alto, Cal.

Date of Collection—April 29, 1911. Serial number 31.

Pemphigus populimonilis Riley

(The Bead-like Cottonwood Gall-louse)

- 1897 Bull. U. S. Geol. Surv., V, pp. 13-14. Original description.
 1880 Thomas. 8th Rept. Ent. Ill., p. 205. Notes and description.
 *1880 Mendenhall. Minn. State Hort. Soc. MSS. Listed.
 1887 Oestlund. Aphid. Minn., p. 24. Listed.
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 1908 Jackson. Syn. of Gen. Pemphigus. Colum. Hort. Soc., pp. 204-206. Description and notes.
 1909 Gillette. Plant Louse Notes, Jr. Ec. Ent., V, p. 356. Listed.
 1910 Williams. Aphid. of Nebr., pp. 10-12. Description and notes.
 1910 Davidson. Calif. Aphid., Jr. Ec. Ent., III, p. 374. Listed.
 1911 Essig. Host Index to Cal. Aphid., P. C. Jr. Ent., III, p. 161. Hosts in California.

WINGED VIVIPAROUS FEMALE (Figure 224 A)

Length of body 3.3 mm., greatest width of the thorax 1.2 mm., greatest width of the abdomen 1.6 mm., wing expansion 10.4 mm. Large species. *Precursing color*—Body dark, covered with long white flocculence which gives it a bluish-white color. The flocculence may be very short or be replaced by a fine white powder, which always covers the ventral surface. *Head*—Black or dark slate, dorsal surface usually naked, ventral surface covered with fine white powder, very small and narrow, being less than half as wide as the mesothorax, evenly rounded anteriorly and fitting tightly against the prothorax. *Eyes*—Very dark reddish brown or black, large. *Antennae*—(Figure 224 B). Reaching to base of the posterior wings or only to the base of the primary wings, black or very dark brown throughout; articles III, IV and V somewhat clavate; lengths of the articles: I, 0.07 mm.; II, 0.08 mm.; III, 0.24 mm.; IV, 0.15 mm.; V, 0.14 mm.; VI, 0.21 mm.; total 0.89 mm. The sensoria are large, transverse and situated as follows: III, six to nine; IV, three to five; V, one to four; VII one. *Rostrum*—Reaches to or nearly to the second coxae, dark throughout, but darker at tip. *Prothorax*—Slightly wider than the head, but very short, black. *Mesothorax*—Black, lobes well developed and extending much higher than any other part of the body. *Metathorax*—Black with muscle lobes well developed. *Abdomen*—Dark olive green to brown, covered with long white flocculence or fine powder (always so ventrally), widest near the middle and somewhat pointed at the posterior end, lateral margins of each segment with darker spot, which shows after the body has been cleared for mounting. *Legs*—Normal, hairy, black or very dark brown throughout. *Wings*—Subhyaline, large. *Primary*—Length 4.5 mm., width 1.6 mm. Costal vein heavy, dusky; subcostal wide, dusky; stigma oval to oblong in shape, lower margin well-rounded, lower portion much darker than remainder, with several rows of short hairs, all dusky; length 0.90 mm.,

width 0.30 mm. Stigmal vein undulate, arising near the tip of the stigma and rather sharply curved downward until near the middle, then curves upwardly until near the tip where it turn down, curves well rounded and not at all abrupt, brown; first discoidal arising near the middle of the subcostal vein and extending almost straight to the wing margin at an angle of nearly 45 degrees to it, usually curves slightly inwardly towards the body; second discoidal rises near the base of the first, and extends nearly parallel to the third discoidal, curves slightly inwardly, much longer (nearly twice) than the first discoidal; third discoidal obsolete at base, nearly parallel with second discoidal but diverges towards the tip of the wing, the tip is midway between tips of the stigmal and second discoidal; veins brown or amber. *Secondary*—Length 3.2 mm., width 0.9 mm.; subcostal with two downward curves, one at the bases of the discoidals and the other two-



Figure 224. *Pemphigus populimonilis* Riley

thirds its length; discoidals arising at one-third the length of the sub-costal, where it makes a rather sharp bend, from a rather narrow brown or amber spot, their bases close together; first discoidal curving towards the tip, while the second curves toward the base of the wing; veins amber. *Cauda*—Well rounded and inconspicuous.

Nymphs—The nymphs of the winged viviparous females are often very large before their wings are fully developed. The color varies from a light yellowish to a dusky green. The head is usually darker. The entire body is covered with a very fine white powder and there is no sign of flocculence until the adult stage is reached.

APTEROUS VIVIPAROUS FEMALES

Apparently there are no apterous forms occurring in the galls observed in this locality.

Hosts—Infesting the common Cottonwood (*Populus trichocarpa* T. & G.), forming rows of the bead-like galls on the leaves. The galls are formed more

often on the undersides of the leaves, though not a few are formed from above, and along the margins or midway between the margins and the midrib in longitudinal rows. From the photograph (Figure 225) it will be seen that they are arranged indiscriminately also and may be very near the midrib in a single row or the rows may extend transversely to the main axis of the leaf. They are formed by a pushing up of the leaf tissues and the infolding of the tissues around the margins of the galls so as to almost completely close the mouth. The surface of the galls varies from a light green to a dark red in color and is usually rather rough. Each gall is just large enough to conceal a single individual and grows with its occupant.

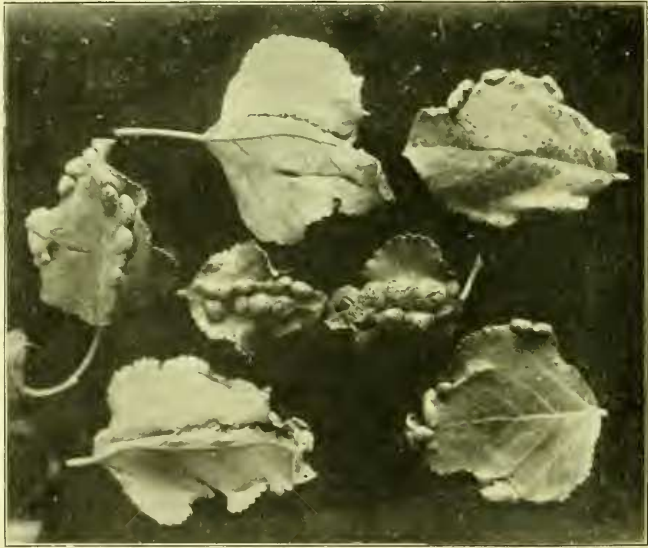


Figure 225. *Pemphigus populimonilis* Riley
Showing moniliform galls from ventral and dorsal surfaces of leaves.

Never more than one insect is found in a single gall, but often there are several guests in the form of the larvæ of syrphid flies which completely destroy large numbers of the lice before they mature. Figure 226 shows the opened galls and in some are to be seen these maggots. It is difficult to find a single gall that does not contain at least one of them. The adult fly deposits her eggs in the gall while it is being formed and before the mouth closes up and thus defeats the object of protection which the galls should furnish the lice. If anything, the larvæ of the syrphid flies are protected from their natural enemies while they are feeding upon them.

Pemphigus populimonilis Riley was first reported on the narrow-leaved Cottonwood (*Populus balsamifera* L. var. *angustifolia* Torrey), but has since been found feeding upon *Populus trichocarpa* T. & G. first by Gillette in Jr. Ec. Ent. II, p. 356, 1909, near Portland, Oregon. Davidson reports it from *Populus fremonti* in Jr. Ec. Ent. III, p. 374, 1911.

Locality—The species as described was taken in large numbers along the banks of the Santa Clara River near Santa Paula, Cal.

Date of Collection—June 22, 1911. Serial number 40.



Figure 226. *Pemphigus populimonilis* Riley

Underside of a leaf with the galls opened so as to show the aphids and the larvae of syrphid flies.

I have been able to procure three descriptions of this insect; by Thomas (who practically duplicates the original description given by Dr. Riley), Jackson and Williams. From them I am led to believe that they are all practically the same as that of the original description of Riley. Either the species was originally and afterward very poorly described, or the species which I have described varies a great deal from the individuals taken in the East. The following differences are noted:

Size—All of the above descriptions agree exactly regarding the size of the species and their measurements are much less than those of the above specimens. For instance, Thomas gives 6.4 mm. as the average wing expanse, while the

average wing expanse of the species as taken here is slightly over 10 mm. All measurements were made with a camera lucida.

Antennal Articles—Antennal articles I, II, IV and V are given subequal, while I have found that I and II are nearly equal and that IV and V are practically sub-equal, but that the articles IV and V are much longer than I and II (nearly twice as long or a third longer). Articles III and VI correspond very well.

Rostrum—In the specimens taken here the rostrum rarely reaches beyond the second coxæ. Thomas reports it as reaching to the third coxæ.

Wings—The venation of the wings agrees very well in all respects except the shape of the stigma. I have found it well rounded or nearly oblong instead of angular.

Though these differences are considerable, the general descriptions agree well and I feel perfectly satisfied that the species is as named. No doubt that with our early warm springs the young develop more lustily and this may account for the difference in size, which may also influence other characters.

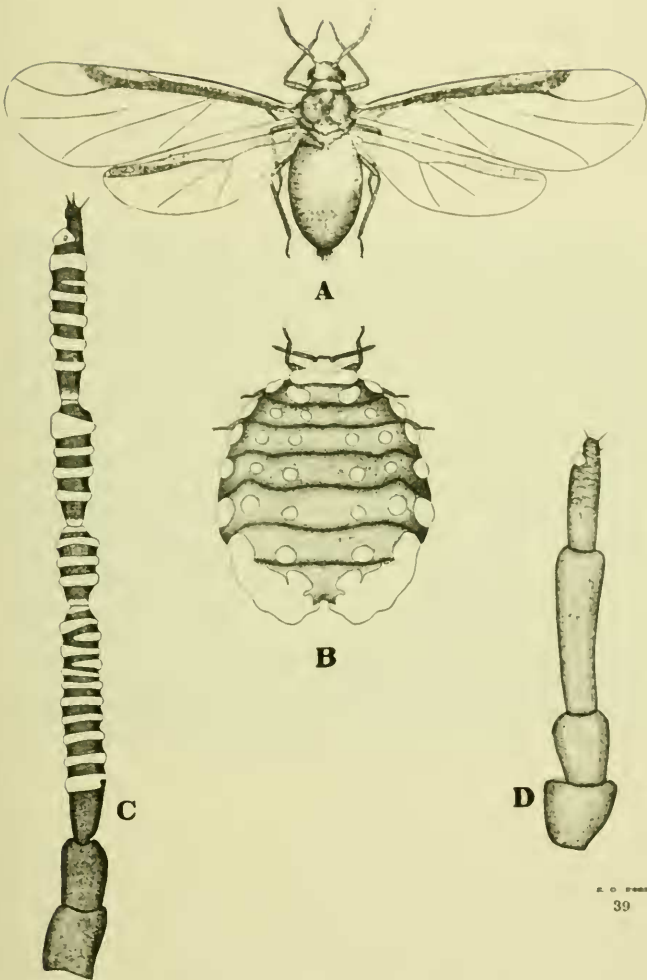
Pemphigus populicaulis Fitch

(The Poplar-stem Gall-louse)

- 1859 Fitch. Rept. Ent. N. Y. V, pp. 845-849. Original description.
 1868 Walsh-Riley. Am. Ent. III, p. 57 and p. 245. Description and notes.
 1873 Le Baron. Rept. Ent. Ill. III, p. 193. Notes.
 1879 Thomas. 8th Rept. Ent. Ill., p. 149. Description.
 1880 Henry. Am. Ent. I, p. 205. Reference to galls.
 1886 Oestlund. List Aphid. Minn., p. 55. Listed.
 1887 Oestlund. Aphid. Minn. p. 24. Description.
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WINGED VIVIPAROUS FEMALE (Figure 227 A)

Length of body 2 mm., width of thorax 0.6 mm., width of abdomen 0.75 mm., wing expansion 6.7 mm. *Prevailing color*—Nearly black body almost or entirely covered with a long whitish floeculence which gives the body a bluish tinge. The



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Figure 227. *Pemphigus populicaulis* Fitch

abdomen is dull green or brownish. *Head*—Small, nearly as long as wide, black. *Eyes*—Rather large and very dark—from dark brown to almost black. *Antennae*—(Figure 227 C). Reaching nearly to posterior end of the thorax, black throughout except the base of article III, which is dull green. The lengths of the articles are as follows: I, 0.06 mm.; II, 0.068 mm.; III, 0.24 mm.; IV, 0.078 mm.; V, 0.12 mm.; VI, 0.2 mm.; total 0.766 mm. The last four articles are traversed by large transverse sensoria which extend almost entirely around the articles and which are distributed as follows: III with from ten to fourteen; IV, usually three; V, three to five; VI, seven to eight. *Rostrum*—Dull green with dark base and tip, reaching to the base of the second coxæ. *Prothorax*—Black or dull greenish,

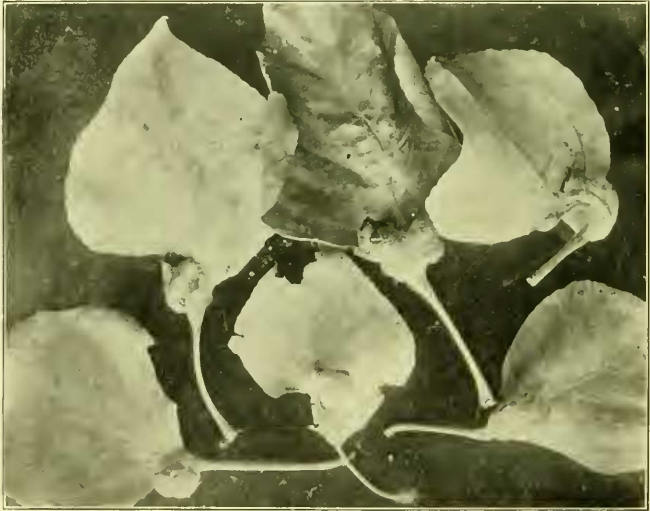


Figure 228. *Pemphigus populicaulis* Fitch
Showing the galls from both dorsal and ventral aspects of the leaves.

slightly wider than the head and narrower than the meso-thorax. *Mesothorax*—Well developed with raised muscle lobes, black. *Metathorax*—Black with prominent muscle lobe. Thorax covered with fine white powder. *Abdomen*—Oblong, dull green to brown, covered with whitish floeculene and fine white powder, with a row of darker spots along the lateral margins—a spot on each abdominal segment. *Legs*—Dark throughout, normal, slightly hairy. *Wings*—Subhyaline, sometimes of a very dark cast, but always with a constant coloring. *Primary*—Length 3 mm., width 1 mm. Costal vein dark and well defined to the stigma; subcostal widening as it approaches the stigma, dusky; stigma nearly three times

as long as wide, rounded at apex, opposite sides nearly parallel, dusky with basal half much darker than the upper portion, hairy on lower border; stigmal vein arising near the tip of the stigma, evenly curved throughout its entire length, but not deeply curved; first and second discoidals arising near the middle of the subcostal, bases close together; first discoidal nearly straight; second discoidal nearly twice as long as the first and curving inwardly; third discoidal obsolete for a considerable part of the base, curving slightly towards the upper wing margin, running nearly parallel to the main axis of the wing. All veins dusky. *Secondary*—Length 2.1 mm., width 0.6 mm. Subcostal vein with sharp downward bend one-third its distance at the base of the discoidals and a more gradual downward bend two-thirds its distance from the base to the tip. Discoidals arising from the first bend with their bases close together. First discoidal short, curves toward the wing tip, with little slant; second discoidal with a sharp slant towards the apical lower wing margin, straight, considerably longer than the first vein; veins dusky. *Cauda*—Obsolete.

Nymphs—The winged viviparous females as well as the stem mothers or apterous viviparous females were giving rise to great numbers of the young of the winged females, there being none of the apterous young produced in this way within the galls. These nymphs vary from almost transparent white or yellowish to a dusky green color with amber or pinkish thoraxes. Legs dull yellowish or whitish with dusky articulations. Rostrum light with dark tip and extending just beyond posterior base of the first coxae and not quite to the second coxae. The bodies are early covered with a fine white powder which gives them a grayish or whitish appearance.

APTEROUS VIVIPAROUS FEMALE OR STEM-MOTHER (Figure 227 B)

Length 2.5 mm., width 2.2 mm. Nearly globular in shape, though the body is distinctly flattened. Prevailing color dull brown or green with white patches of flocculence distributed as shown in the drawing. *Head*—Black, entirely covered with white flocculence excepting the anterior tip, very small. *Eyes*—Simple and located in position of compound eyes. *Antennae*—(Figure 227 D). Four articulated, short, reaching to base of mesothorax; article I dull blackish, II dusky green, III and IV dull green or brown. The lengths of the articles are as follows: I, 0.06 mm.; II, 0.07 mm.; III, 0.16 mm.; IV, 0.12 mm.; total 0.41 mm. *Rostrum*—Dull green or brown with dusky tip and base, reaching to the second coxae. Thoracic segments well developed and extending much higher than the head. *Prothorax*—Almost entirely covered with white flocculence. *Mesothorax*—With two marginal and two dorsal white patches. *Metathorax*—With two marginal and four dorsal patches. *Abdomen*—Two marginal (one on each margin) of every body segment and four longitudinal rows of dorsal patches. At the posterior end of the abdomen are two large marginal patches which nearly cover up the last segments and in front of these patches are but two dorsal patches instead of the usual four on the abdominal segments, body color dull green or brown. Ventral surface covered with fine powder. *Legs*—Short, dusky throughout, hairy. *Style*—Obsolete.

At the date of collection, June 22, 1911, there was to be found in every globular gall a single stem-mother which was giving or had given birth to great numbers of the winged viviparous females. That this stem-mother produced the original gall is without doubt, for though great numbers of the winged forms have been continually leaving the galls, no new ones are being formed without containing a stem-mother. Either the stem-mothers are produced as a very late brood or they arise from eggs which are deposited by the late broods. The latter idea has been held by writers in the past and is more probable than the first, though in this state it is almost impossible to find any of the Aphids laying eggs, though they are known to do so in the Middle West and East.

Hosts—This species occurs associated with and on the same branches of the common Cottonwood (*Populus trichocarpa* T. & G.) as is *Pemphigus populimontis* Riley, though it is easily told by its characteristic galls (Figure 228). These galls vary from the size of a large pea to a marble and are nearly globular in shape. They are formed at the base of the leaf at the base of the midrib or stem. The stem or midrib so twists as to form a semi-circular opening usually on the underside of the leaf with the opening down, while the leaf tissues serve to cover the twisted area so as to form a very perfect gall. So well is this made that after examining great numbers of them there were to be found no parasitic guests in the colonies and internal hymenopterous parasites could not be bred out of a large number of collected galls. The color varies from a light green to a deep bright red. The wall is thin so as to admit of a large space within. Figure 229 shows a cross section containing from fifty to two hundred individuals of all stages. It is noticeable that the gall remains completely closed until the winged forms are ready to emerge and then the opening is forced at a single point so as to allow but one to leave at a time. The older galls, however, are opened clear across.

This species has also been reported as feeding upon *Populus monilifera* and *Populus tremuloides*, by Eastern and Middle Western writers.

Locality—On the cottonwoods along the banks of the Santa Clara River near Santa Paula, Cal.

Date of Collection—June 22, 1911. Serial number 39.

Tribe CHAITOPHORINI

General Characters

Body—Rather short, wide, flat, covered with fine hair-like bristles, which are often placed on quite large tubercles, especially in the young.

Antennae—Six articulated, except in one genus (*Sipha*), which has but five articles, short, seldom longer than the body. Not on prominent frontal tubercles. Covered with hair-like bristles same as the body. Usually carried at right angles to the main axis of the body or against the sides (especially so in feeding).

Legs—Short and rather stout, hairy.

Wing venation, as in *Aphidini*, veins sometimes with clouded borders.

Cornicles—Short, truncate, variable in length, and not longer than one-tenth the length of the body.

Style—Short, variable in shape, usually blunt at tip.

From these general characters it will be seen that this tribe includes very diverse elements. However this may seem, from the very beginning of the work on Aphidide in America this particular tribe has almost entirely been thrown into two genera, or I might say into but one, since the genus *Sipha* claims but few species. This genus is of course *Chaitophorus* Koch. The typical American species, and so recorded by Prof. Oestlund (List Minn. Aphid., p. 48, 1886,) has long been the type for comparing most of the species belonging in the above tribe, without paying much attention to the original European type or endeavor-



Figure 229. Galls of *Pemphigus populicaulis* Fitch
Split to show the great number of inhabitants

ing to separate the widely varying forms into new genera. Prof. H. F. Wilson in the *Canadian Entomologist*, Vol. XLII, December, 1910, pages 384 to 388, has taken the first step in the direction of revision by creating a new genus, *Thomasia*, out of what has been considered the American type form for the genus *Chaitophorus*.

If one attempts to make any extensive determinations of the various species of this tribe by means of the literature of today, he cannot but have it forcibly brought to his mind, how poor the descriptions really are, and how difficult it is to accurately place a new insect even in the right genus. This is, of course, largely

because of the loose characterization of the genera. Because of the past complications, I have accepted the revision as proposed by Prof. Wilson and in attempting to place new species found it necessary (and I believe the characters of the species necessitate it) to form three new genera.

In examining the key it will be seen that the principal characters for separating the genera are the comparative lengths of the spur of the antennal article VI with the base, the length and shape of the cornicles, and the length and shape of the style, all characters which are perhaps the most constant in this tribe. There are but five genera represented as follows: *Arctaphis* Walker, *Chaitophorus* Koch, *Symdobius* Mordwilko, *Thomasia* Wilson, and *Sipha* Passerini. To these, I have added the following new genera: *Eichochaitophorus*, *Micrella* and *Fullawaya*. If I accepted Wilson's classification at all I found that I could not place *Micrella* in the genus *Thomasia* because of the longer spur of antennal article VI; it was impossible to place it with *Arctaphis* because of the shape of the style; it is certainly an intermediate between these two. *Eichochaitophorus*, because of the shorter antennal spur, cannot be placed with *Arctaphis*, though the style is of the same general character. This might have been overlooked, had it not been that the species described has a very distinct, constricted anal-plate which seems to place the genus somewhere between the present genus *Arctaphis* and the genus *Callipterus*. The long stipe of the style is different from that of the former, and in consideration of all the characters, I could not find a place for it in any of the older genera, so created the new one. *Fullawaya* is a splendid new genus, combining to a remarkable degree characters of several widely separated genera. The body, in shape and construction, resembles greatly some of the species of *Aphis*, while the lack of cornicles suggests some other genera. The general clothing of hair is as in this tribe. The feeding habits differ from all other members of the tribe, so far as I know, this being a root and subterranean form rather than an aerial and leaf- or bark-eating form. It falls just between *Symdobius* and *Thomasia*, though it is widely different from either.

According to the following Key to Genera and Species it will be seen that nearly all of the Eastern *Chaitophorus* fall in the new genus *Thomasia* and into this genus also fall the species recently described by me as *Chaitophorus salicicola* (P. C. Jr. Ent. III, p. 534, 1911). Also into this new genus fall *Ch. populifoliae* Fitch, *Ch. negandinis* Thomas, *Ch. viminalis* Monell (though this is somewhat difficult to handle because of the varied forms and contradictory descriptions), and a new species, *crucis*, described in this article.

Provisional keys to the present known genera and to the California species are as follows:

Key to Genera

- | | |
|---|---|
| 1. Antennæ six articled | 2 |
| Antennæ five articled. | 8 |
| 2. Spur of article VI at least three times as long as the base. | 3 |
| Spur of article VI not three times as long as the base. | 6 |
| 3. Spur of article VI not more than five times as long as the base, cornicles not longer than the base. | 4 |

- Spur of article VI more than five times as long as the base, and cornicles longer than the base. *Chaitophorus*
4. Spur of article VI more than four times as long as the base, cauda constricted at the base. 5
Spur of article VI not four times as long as the base, and the cauda not constricted at the base. *Micrella*
5. Stipe of cauda well developed and on a conical base, anal plate constricted in the middle. *Eichochoaitophorus*
Stipe of cauda obsolete or not well developed and on a quadrangular base, anal plate well rounded. *Arctaphis*
6. Antennae about half the length of the body and the spur of article VI considerably longer than the base. 7
Antennae nearly as long as the body and the spur of article VI shorter or scarcely longer than the base. *Symdobius*
7. Cornicles absent, body with lateral tubercles. *Fullawaya*
Cornicles present, lateral body tubercles wanting. *Thomasia*
8. Antennae shorter than the body, cornicles very short and tapering with flanged mouth. *Sipha*

KEYS TO CALIFORNIA SPECIES

CHAITOPHORUS Koch.

Type *Aphis aceris* Linn.

No California representative in this State to date.

MICRELLA n. gen.

Type *M. monelli* n. sp.

One species described.

M. monelli n. sp. On *Salix lasiolepis* Benth. and *S. laevigata* Bebb., at Oxnard and Santa Paula, Cal.

EICHOCHAITOPHORUS n. gen.

Type *E. populifolii* n. sp.

One species as herein described.

E. populifolii n. sp. On *Populus trichocarpa* T. & G., Santa Paula, Cal.

ARCTAPHIS Walker

Type *A. populi* Linn.

No California species reported.

SYMDOBIUS Mordwilko

Type *A. oblongus* Heyden

1. Body small, nearly black, abdomen of apterous female with lateral body tubercles. *macrostachyac*
Body large, never black, abdomen of apterous female without lateral tubercles. *salicicorticis*
- S. macrostachyac* n. sp. On *Salix macrostachya* Nutt., Santa Paula, Cal.
S. salicicorticis n. sp. On base and roots of *Salix laevigata* Bebb., near Santa Paula, Cal.

FULLAWAYA n. gen.

Type *D. saliciradicis* n. sp.

F. saliciradicis n. sp. On roots of *Salix laevigata* Bebb., from four to six inches underground. Santa Paula, Cal.

THOMASIA Wilson

Type *Ch. populicola* Thos.

- | | |
|---|---------------------|
| 1. Article III of the antennæ as long or longer than VI. | 2 |
| Article III of the antennæ not as long as VI. | 4 |
| 2. Article III of the antennæ co-equal with VI. | <i>populifoliae</i> |
| Article III of the antennæ decidedly longer than VI. | 3 |
| 3. Veins of wings with clouded borders. | <i>populicola</i> |
| Wing veins not clouded. | <i>negundinis</i> |
| 4. Antennæ nearly as long as the body. | <i>riminalis</i> |
| Antennæ little more than half as long as the body. | 5 |
| 5. Body of adult female nearly black with longitudinal, light-yellow on dorsum. | <i>salieicola</i> |
| Body of adult female green with light green or yellow cross on the dorsum. | <i>crucis</i> |

T. populifoliae (Fitch). On *Populus fremonti* Wats. Collected in the central part of the State by Davidson. Jr. Ec. Ent. III, p. 375, 1910.

T. populicola (Thos.) Wilson. On *Populus trichocarpa* T. & G. Collected in various parts of Ventura County by the writer. P. C. Jr. Ec. Ent. I, p. 99, 1909.

T. negundinis (Thos.). On *Negundo aceroides* Moench. Collected by Davidson in the vicinity of Stanford University, Palo Alto. Jr. Ec. Ent. III, p. 376, 1910.

T. riminalis (Mon.). On *Salix* sp. In the central part of the State by Clarke. Can. Ent. XXXV, p. 248, 1903.

T. salieicola Essig. In Ventura County on *Salix laevigata* Bebb. and *Populus trichocarpa* T. & G. P. C. Jr. Ent. III, p. 534, 1911.

T. crucis Essig. In Ventura County on *Salix macrostachya* Nutt.

SIPHA Passerini

Type *A. glyceriae* Kalt.

No species reported in this State.

MICRELLA n. gen.

Type *M. monelli* n. sp.

General Characters

Body—Very small, rather flat, covered with long, curved hair-like spines which are strongly tuberculate at their bases in the young, but less so in the adult forms. The general shape is not unlike the members of the genus *Thomasia* Wilson, but much smaller.

Head—Narrower than the prothorax and noticeably small in the adult apterous females. Antennæ arising from the sides and not on even slight frontal tubercles.

Eyes—Three large ocelli which are red and very noticeable in the winged females; compound eyes with terete tubercles.

Antennae—Nearly as long as the body, reaching beyond the bases of the cornicles. Article III not as long as IV and V together and not as long as VI, or the spur, with single row of large circular sensoria. Spur of VI slightly more than three times as long as the base, but never four times as long, very thin or setaceous.

Rostrum—Tip coming between first and second coxae.

Cornicles—Nearly as wide or wider at the bases than the length, very slightly constricted before the mouth which has a very small rim or flange.

Legs—Small and frail.

Style—Strongly tapering to a blunt tip which is usually straight across, not rounded or constricted at the base, no longer than the cornicles, with very few hairs.

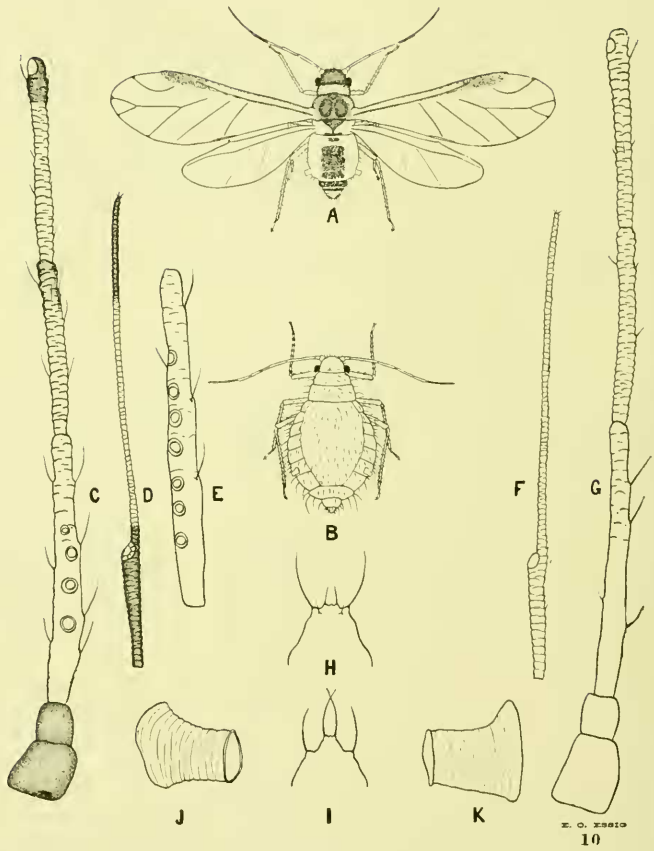
Anal Plate—Well developed, semi-globular, hairy.

Wings—Hyaline, normal in size, venation as in *Thomasia* or *Chaitopharus*, and fairly constant, incision in the upper wing margin at the tip of the stigma.

Micrella monelli n. sp.

WINGED VIVIPAROUS FEMALE (Figure 230 A)

Length of body 1.2 mm., width of the mesothorax 0.39 mm., width of the abdomen 0.48 mm., wing expansion 4.1 mm. *Body*—Very small, slender, hairy. *Prevailing color*—Light green and black. *Head*—Small, nearly as wide as the prothorax, slightly wider than long, nearly straight across the front, hairy, no frontal tubercles, very dark green or nearly black on dorsal and ventral surfaces. *Eyes*—Large, with tubercles, dark red, three large ocelli. *Antennae*—(Figure 230 C, D, E). Not on frontal tubercles, nearly as long as the body, slender, imbricated, with few hairs, articles I and II dark green, but not as dark as the head, III light green throughout, IV light green with tip faintly dusky, V light green with tip nearly black, VI with base dark and base and apical one-third of the filament, or spur, dark. Lengths of the articles: I, 0.05 mm.; II, 0.038 mm.; III, 0.24 mm.; IV, 0.16 mm.; V, 0.18 mm.; VI, 0.42 mm. (base 0.10 mm., filament or spur 0.32 mm.); total 1.088 mm. Article I is wider and longer than II, III is shorter than VI or the filament of VI, not twice as long as either IV or V and not nearly so long as the sum of the two, IV not so long as V and half as long as the spur of VI, VI with base much shorter than either IV or V and not quite one-third so long as the filament, which is very slender. The large circular sensoria are arranged in a row on III, varying from four to seven in number. There is but one large one at the apex of V and one large one and many small ones on VI at the base of the filament. *Rostrum*—Reaches to the second coxae, light green or yellow with dark tip. *Prothorax*—Scarcely wider than the head and not so long, hairy, dusky green, but lighter than the head or the other two thoracic segments. *Mesothorax*, dorsum dark green with muscle lobes black, ventral surface all black except the coxae, which are light green. *Metathorax*—Green with dark dorsal markings which appear in shape like a goblet with the base at

Figure 230. *Micrella monelli* Essig

the base of the segment and the top against the mesothorax. *Abdomen*—Scarcely wider than the thorax, not distinctly segmented, hairy, light green with median dorsal black patches and transverse dorsal dark bands across the last two abdominal segments. Of the dorsal patches the first is very small and is on the first segment, the second is large and extends to the lower margins of the cornicles. Anal plate rounded and dusky green. *Cornicles*—(Figure 230 J). Slightly longer than the width of the base, base widest, very slightly or not constricted before the apex, mouth flaring but very little or none, with parallel broken lines around surface, light green (concolorous with surrounding body area), length 0.08 mm., width of the base 0.073 mm., width of mouth 0.046 mm. *Legs*—Small, slender, hairy, transparently white or light green throughout. *Wings*—Normal, hyaline. *Primary*—Length 4.8 mm., width 0.65 mm., margin constricted at the tip of the stigma, venation fairly constant, but variable as in nearly all members of this tribe. Costal, wide and distinct, dusky brown. Subcostal little wider than the costal, dusky brown. Stigma quite oval, tip blunt or rather sharp, short, dusky brown, of a uniform color throughout, lower margin hairy, length 0.45 mm., width 0.1 mm. Stigmal vein short, well curved throughout, but strongest in basal half, tip clouded, arises nearer the tip than the middle of the stigma. First discoidal arising beyond the middle of the subcostal, straight or curved inwardly. Second discoidal sub-obsolete at the base, straight, not reaching the margin of the wing, base midway between the bases of the first and second discoidals. Third discoidal normally twice-forked, obsolete at the base, first fork one-third the distance from the base to the tip of the lower branch of that fork, second fork one-half the distance from the first fork to the tip of the wing, or more often nearer the tip of the wing. Tips clouded. This vein is often but once forked as has been observed in so many of the small species taken here. All the veins are dusky brown in color. *Secondary*—Length 1.25 mm., width 0.4 mm. Normally with subcostal and two discoidals. Subcostal undulate with strongest downward curve below hooklets and beyond the base of the second discoidal. Discoidals very light, bases not very far apart, the base of the second near the middle of the subcostal, bases also obsolete, or nearly so. First vein slightly curved inwardly, second straight. *Style*—(Figure 230 I). Short, tip nearly straight across with large spine on each lateral corner, base much wider than apex, slightly dusky or light green, length 0.055 mm., width of base 0.075 mm.

APTEROUS VIVIPAROUS FEMALE (Figure 230 B)

Length 1.4 mm., width of the abdomen 0.8 mm. *Body*—Wide and very flat, covered with long tuberculate hairs. *Prevailing color*—Transparently light green throughout. *Head*—Small, narrower than the thorax, rounded, hairy, without antennal tubercles, pale light green. *Eyes*—Compound eyes, bright red, with tubercles. *Antennae*—(Figure 230 F, G). Nearly as long as the body, reaching beyond the bases of the cornicles, very slender throughout, but a mere filament; apical third and remaining articles imbricated, colorless or transparently white throughout, very few hairs. Lengths of the articles: I, 0.065 mm.; II, 0.04 mm.; III, 0.25 mm.; IV, 0.17 mm.; V, 0.18 mm.; VI, 0.12 mm. (base 0.12 mm., filament

0.3 mm.); the relative lengths compare well with those of the winged form. Usual sensoria on V and VI. *Rostrum*—Not reaching to the second coxæ, transparently white. *Thorax*—Prothorax and mesothorax considerably narrower than the metathorax and the abdomen, light green. *Abdomen*—Well rounded, wide, flat, margins show segmentation plainly, but it is not carried across the dorsum, very light green. Anal plate, well rounded, light, hairy. *Cornicles*—(Figure 230 K). Same general shape as those of the winged female, but larger, light yellow to concolorous with body, length 0.08 mm., width of the base 0.09 mm., width of the mouth 0.05 mm. Usually slightly longer than broad. *Legs*—Slender and frail, hairy, transparently white throughout. *Style*—Short, nearly conical, concolorous with body, length 0.05 mm., width of base 0.065 mm., with few hairs.

Young—Transparently light green or yellow to colorless. Body bearing many large tubercles, each supporting a large curved hair or spine.

Host—Found feeding only upon the leaves of the tender shoots and suckers of *Salix lasiolepis* Benth. During the year 1910 they were exceedingly abundant and attacked all of the leaves, young and old, but never the bark. Very much honey dew was excreted, smutting the trees until they appeared black. This summer I was able to collect but very few, although a sharp lookout was maintained throughout the year. The winged forms were exceedingly rare. This scarcity is probably due to the ravages of the internal and predaceous enemies, which were exceedingly numerous both last year and this summer, the larvae of a syrphid fly being predominant. On September 14, 1911, I took this species in small numbers from *Salix Laevigata* Bebb.

Locality—Found only on willows growing near the ocean beach on a freshwater marsh just inside the sea-wall, three miles from Oxnard, Cal., on what is known as the McGrath Estate. Though a careful search has been made of all species of willow trees in every other part of the county, I have never been able to locate this species in any other place except late in the fall along the Santa Clara River near Santa Paula, Cal.

Date of Collection—July 1, 1910, and September 14, 1911. Serial number 10.

Because of its long antennal filament and other characters which exclude this species from *Arctaphis* (the constricted style) I have placed it in the genus *Micrella*. Having never collected what I believe to be the true *Chaitophorus* Monell, and without comparative material except published descriptions, I sent this species on to Mr. Monell, asking him if it was identical with *C. riminalis* Mon. His reply was as follows: "No. 10 on *Salix* is a new species of *Chaitophorus*" (St. Louis, Mo., Oct. 3, 1910). Because of his valuable aid in this work I am naming this species for him. A comparison of *Micrella monelli* n. sp. with the descriptions of *Chaitophorus riminalis* Monell and its synonym *Chaitophorus nigrae* Oestlund brings out some most notable differences, as follows:

Ch. viminalis Mon.*Body*—

Length 1.52 to 1.65 mm.

Apterous forms often dark.

Antennae—

Filament slightly longer than III.

IV a little longer than V.

Ch. nigrae Oestl.

Length 1.50 mm.

Apterous forms dark.

III longest.

IV longer than V.

Tips of segments dark.

M. monelli n. sp.

Length 1.2 to 1.4 mm.

Smaller species.

Apterous forms very light with none dark.

Filament of VI much longer than III.

IV shorter than V in winged and apterous forms.

Legs robust, tips dark throughout.

EICHOCHAITOPHORUS n. gen.

Type *E. populifolii* n. sp.

Body—In winged individuals the head little narrower than thorax, and abdomen little wider than thorax. In apterous forms the body is broad across the middle of the abdomen, tapering anteriorly to a rather broad head and rounding off posteriorly to a blunted point, flat. Covered with long and short stout spines which are situated on rather large body tubercles. Small species.

Head—Broad across the front which is straight or well rounded. Antennae arise from sides of the head just in front of the eyes, leaving a wide space between their bases. Without antennal frontal tubercles. Front hairy.

Eyes—With terete marginal tubercles behind.

Antennae—Not as long as the body, reaching to or slightly beyond the bases of the cornicles. Carried close to the sides of the body when the insect is feeding, at right angles with the main axis of the body when moving about. Article I wider, but little or no longer than II, III nearly or as long as IV and VI together, but shorter than VI or the spur of VI, the spur of VI less than four times as long as the base and always longer than III and never so long as the sum of the lengths of IV, V and the base of VI. Sensoria large, circular, from three to nine on article III, none on IV, one at the apical end of V, and one large and six small in the process of VI. Sensoria on III situated in a single row, if three or four they are usually within the basal half, if eight or nine they extend nearly the full length of the article. Articles imbricated.

Rostrum—In winged forms reaching just beyond the second coxae. In apterous forms reaching to third coxae.

Thorax—Wider than head, but not wider than the abdomen.

Cornicles—Truncate or nearly so, longer than wide, approximately as long as the style including the wide base. Wider at the base, slightly flaring at the mouth, but not as wide as at the base, narrowest just before the mouth, with network of lines on the surface.

Legs—Rather small and slender, but not abnormally so, well in proportion with the rest of the body, hairy as in *Chaitophorus*. Article I of tarsi one-third as long as article II.

Style or Cauda—Distinctly knobbed, restricted below knob and enlarged again at base, which is wider than the diameter of the round or globular knob,

with many long and short curving spines. Style usually hid beneath the projecting pygidium or last abdominal segment which is well rounded and hairy.

Anal Plate—Distinctly bifurcated, but not as deeply forked as in the genus *Callipterus*, situated well under the body, with long and short curved spines which are set on slight tubercles.

Wings—Rather slender, normally typical *Aphis* venation, but very variable as shown in accompanying cuts (Figure 231, 1-19). Stigma rather short and oval in shape, about three times as long as broad, light streak near lower margin, below which is an irregular row of short hairs. Stigmal vein and first and second discoidals as in *Chaitophorus*, third discoidal variable, from once to thrice forked, though it is normally twice forked, locations of forks exceedingly difficult to fix and seldom constantly located, usually obsolete at the base. Veins without clouded borders. Membrane hyaline or slightly darkened. Finely punctured or sealed. Secondary wings with normally two discoidals, but often with but one.

It has been with a great deal of reluctance that I have created this new genus, and not without a vast amount of examination of both literature and specimens. I have also sent specimens to Prof. Davidson, who wrote: "I do not know of any aphid like No. 16. It seems to resemble *C. nigrae* Oestl. slightly but is not same species of course. Williams in his 'Aphididae of Nebraska' p. 27, says of *Ch. nigrae*, 'tail knobbed'." The species cannot belong to the genus *Chaitophorus* as it now stands for in looking at the characters which determine the genus we find the following, which does not agree with the above description: "Antenna on indistinct frontal tubercles; spur of the sixth segment longer than the third, and about six times as long as the sixth segment. Cauda very short, being but a knob. Wing venation regular. Nectaries six times the length of the cauda and constricted in the middle." Wilson, A Second Paper on the Genera in the Subfamily Callipterinae, Can. Ent. Dec. 1910.

The genus which it seems to most resemble is *Arctaphis* Walker, the type of which is *Aphis populi* Linn. According to Wilson, in the article referred to above, the cauda is a knob on a quadrangular base. The anal plate is broadly rounded. In the new genus the style has a distinct neck and is situated on a very distinct conical base. The anal plate is deeply notched in the middle so as to make it somewhat forked as in the genus *Callipterus*.

In a general way the genus under consideration lies between the old genus *Chaitophorus* and the genus *Callipterus*, having the general body characteristics of the former and the style and anal plate of the latter.

Eichochoaitophorus populifolii n. sp.

WINGED VIVIPAROUS FEMALE (Figure 231 A)

Length of body 1.6 mm., width of mesothorax 0.5 mm., width of the abdomen 0.6 mm., wing expansion 5 mm. A very small and active species. *Prevailing color*—Dull green head and thorax and light green abdomen. *Body*—Very thin and flat. *Head*—Well rounded anteriorly, bristled, dull or dusky green, sometimes nearly black. *Eyes*—Dark red, small with distinct tubercle. *Antennae*—(Figure 232, 1-6). Not quite as long as the body, not on frontal tubercles, hairy.

imbricated. Article I dusky olive green, but lighter than the head, II light yellow, often slightly dusky, III and IV light yellow throughout, V yellow with dusky tip, VI dusky throughout. The lengths of the articles are as follows: I, 0.05 mm.; II, 0.05 mm.; III, 0.36 mm.; IV, 0.23 mm.; V, 0.15 mm.; VI, 0.375 mm. (spur 0.375 mm.); total 1.315 mm. Articles I and II are co-equal, III is nearly as long as IV and V together, but shorter than VI, IV is much longer than V, the spur of VI is nearly four times as long as the article and is longer than article III. The lengths of the articles vary considerably as the drawings of the article III show in the cut, but the comparative lengths are fairly constant. Article III bears from three to nine rather large circular sensoria, V and VI bear the usual

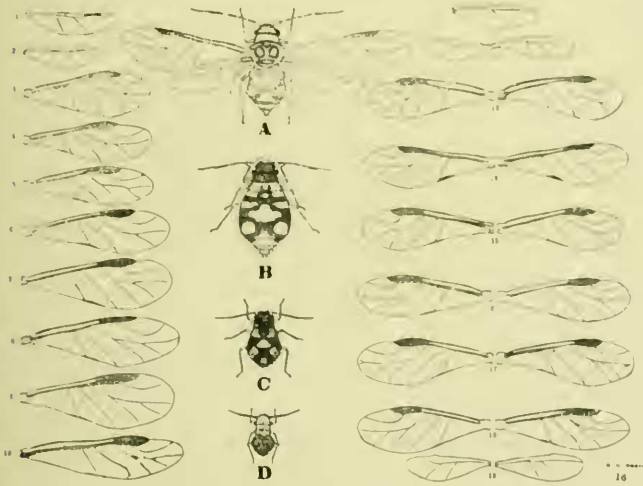


Figure 231. *Eichochaitophorus populifolii* Essig

number. *Rostrum*—Reaches just beyond the second coxae, transparently white with red or brownish tip. *Prothorax*—Concolorous with the head, and very little wider. *Meso- and Metathorax*—Dull olive green with lobes well developed and black, shiny. *Abdomen*—Flat, hairy, yellowish with dull or light green dorsal markings as follows: Large green transverse irregular band just behind the thorax; irregular green transverse band near middle of abdomen, this band curves deeply toward the cauda in the middle; two green blotches just back of the cornicles, the bases of which blend into a transverse green band which extends across the dorsum; a green transverse band near the caudal end. Tip of abdomen light yellow. These markings may vary, but there is always a large yellow blotch just behind the first green band, yellow areas around the bases of the cornicles,

and a yellow tip. Anal plate (Figure 232, 18) very distinctly bifid, but not as much so as in the genus *Callipterus*, very hairy or covered with long spines. The anal plate is usually hid by the pygidium which extends over it dorsally, light yellow in color. Ventral surface pale uniform green. *Cornicles*—(Figure 232, 10). Longer than broad, somewhat truncate, broader at the base and flaring at the mouth, narrowest just before the mouth, longer than broad, light transparent yellow, the base surrounded by a yellow area, surface covered with irregular mosaic figures which are nearly circular parallel lines at the base. Length 0.1 mm. *Legs*—Normally long and hairy, transparently yellow with femora and tips of the tarsi (Figure 232, 12) dusky amber. The femora of the metathoracic legs are darker than those of the other two pairs. *Wings*—(Figure 231, 1-19). Slender, hyaline to faint sub-hyaline and venation very variable. *Primary*—(Figure 231, 3-18). Length from 1.95 mm. to 2.4 mm., width from 0.65 mm. to 0.8 mm. Venation exceedingly variable within the species and within the same individuals. The most typical venation is shown in the wings of the winged female and may be expressed as follows: Costal wide to base of stigma, dusky brown; subcostal wider than the costal, dusky brown; stigma (Figure 231, 11) dusky brown, rather short and oblong, narrowest at base and widest at the base of the stigmal vein with both sides uniformly sloping to form a blunt tip, light streak near the ventral border and the area between the light streak and the bottom margin covered with about sixteen short curved hairs which are situated on slight tubercles, length 0.1 mm., width at stigmal vein 0.03 mm. Stigmal vein arises near the apical end of the stigma and is usually strongly curved downward in the first half and more gradually curved in the remaining half—may even be undulate. The discoidal veins are the most variable, but normally the first discoidal is slightly curved outwardly at the base and from thence continues almost straight to the wing margin, it arises from the middle of the subcostal; second discoidal arises from the subcostal nearly midway between the bases of the first and third discoidals, but slightly nearer the base of the first, is usually bent outwardly; third discoidal is obsolete at the base, twice-branched, nearly parallel to the second discoidal, first branch arises near the middle and extends nearly straight towards the middle of the wing tip, the second fork being formed near the middle of the first branch, the lower branch runs parallel to the third vein. From this normal venation will be found almost every conceivable graduation. The wings represented by Figure 231, 13 to 17 inclusive, are pairs, while the wings from 3 to 10 inclusive are taken from individuals whose other wings were normal. The *costal* and *subcostal* veins are normal and constant throughout; the *stigmal vein* is constant in a large majority of cases as in 3, 4, 8, 10, 14, 15, one of 16, 17 and 18, but in 5 the base is obsolete and the curve slight, in 6 the base is also obsolete with a portion isolated from the remainder, in the right wing of 13 it is undulate as is also the case in the right wing of 16. In all it is noticeable that the greatest amount of curvature is in the basal half of the vein. *First discoidal* is straight as shown in 6, 8, 9, 10, 15, 16, 17, in 3 and 5 undulate, in 4, 7, 14, 17 and 18 curved outwardly. *Second discoidal* is straight in the drawing of the winged female and in 8 and 14, slightly undulate in 5 and 6, bent outwardly

in the remainder. *Third discoidal* normally twice-branched as shown in A, 8, 8, 9, and the right wings of pairs 14 and 18. In 6, right wings of pairs 13, 14, 16 and 18, and both wings of 15, the right wing of 13 shows a rudiment of a second branch near the wing tip; the great difference in the position of the forks of all of these veins are noticeable. In one case, the left wing of 17, there is a third fork near the wing margin and a reverse third fork near the margin of the right wing. The base of the third discoidal is normally obsolete as is shown in nearly every wing. In 10 the base of the first fork is broken up very badly, and in many cases the lower branches of the two forks are badly twisted, but in spite of this it will be seen that they are usually parallel. All veins dusky brown. *Secondary*—(Figure 231, 1, 2, 11, 12 and 19). Also variable in venation. Length from 1.3 mm. to 1.44 mm., width from 0.35 mm. to 0.37 mm. Normally with two discoidals,

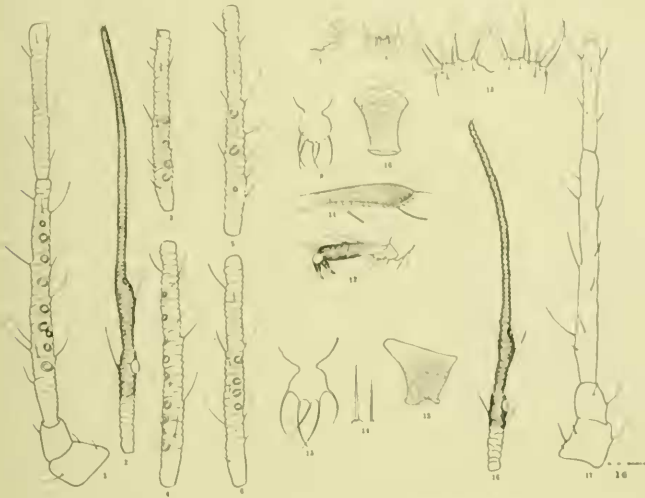


Figure 232. *Eichochoaitcphorus popalifolii* Essig

but often with only one. Subcostal undulate, usually most strongly curved at the base of the second discoidal, may or may not extend to the tip of the wing. First discoidal arises slightly beyond one-third the distance from the base to the apex of the subcostal, may be obsolete at the base or wanting as shown in 11 and left wing of pair 12, straight, does not extend to wing margin, dusky brown. Second discoidal arises near the middle of the subcostal at its greatest bend, is considerably longer than the first discoidal, nearly straight or slightly bent outwardly. *Style*—(Figure 232, 7, 8, 9). Distinctly globular with a very narrow neck and a base wider than the knob, yellow, with rather long coarse spines.

Resembles the style of the genus *Callipterus*, but is more knobbed than any of the members of the genus *Chaitophorus* which have been under my observation. Length 0.08 mm., width or diameter of knob 0.045 mm., width of base 0.06 mm.

APTEROUS VIVIPAROUS FEMALE (Figure 231 B and C)

Length of body 1.4 mm., width of abdomen just in front of the cornicles 0.76 mm. A thin, flat and very small species. The entire body is covered with long and short spines, each of which is situated on a tubercle (Figure 232, 14). *Prevailing color*—Green and yellow, variegated, or reddish brown and yellow, markings nearly always constant. *Head*—Broad across the front and nearly rectangular in shape, hairy, dusky green or dusky yellow, often with yellow median markings, nearly twice as wide as long. *Eyes*—Bright red, with lateral marginal tubercle behind. *Antennae*—(Figure 232, 16 and 17). Arising from near the sides of the head, reaching nearly to the bases of the cornicles, hairy; imbricated; article I yellow, II dusky yellow, III and IV transparently white or yellow, V transparently yellow or white with a dusky tip, VI dusky throughout; lengths of articles: I, 0.06 mm.; II, 0.55 mm.; III, 0.295 mm.; IV, 0.16 mm.; V, 0.115 mm.; VI, 0.45 mm. (spur 0.31 mm.); total 1.135 mm. I and II are practically subequal, III is as long or longer than IV and V together, but shorter than VI or the spur of VI, IV is longer than V, V slightly shorter or nearly co-equal with the base of VI. The spur of VI not as long as the sum of IV, V and VI. *Sensoria* normal on V and VI. *Rostrum*—Reaches to third coxae, transparently white or yellow with red tip. *Prothorax*—Of the older and larger individuals dusky green, in the younger reddish females there is a distinct lateral yellow blotch on each side of the dorsum. *Meso- and Metathorax*—With irregular green blotch on the median dorsum or a large red blotch covering the median third of the dorsal area and a yellow margin on each side in all cases. *Abdomen*—Flat, widest near the middle, rounded or pointed posteriorly, covered with stout hairs, markings fairly constant and as follows: ground color either dark green or reddish brown (the larger specimens are usually green, while the smaller ones sometimes appear red or brown). In the larger green forms there are two marginal, transverse yellow blotches near the base which extend about one-third the width of the abdomen from each side, in the middle of the dorsum is a large somewhat triangular yellow spot, a yellow spot around the base of each cornicle, and a median quadrangular or diamond-shaped yellow spot at the posterior end including the pygidium. In the smaller reddish individuals the markings are nearly the same, but lack the lateral yellow transverse spots near the base. These are partly included in the large yellow spots on the sides of the meso- and metathorax. The median dorsal spot is distinctly triangular, and the posterior yellow spot is slightly dusky near the extreme end. The anal plate is slightly, but distinctly bifurcate as in the winged forms and covered with long stout spines, color of the ventral body surface which is yellowish or greenish. *Cornicles*—(Figure 232, 15). In general shape, size and color they resemble those of the winged individuals, but perhaps a trifle shorter and wider at the base. *Legs*—Normal, hairy, transparently white or yellow, with femora slightly amber and tibiae and tarsi dusky amber.

Style—(Figure 232, 13). Distinctly globular with small neck and wide base as in winged specimens, yellow, hairy, length 0.09 mm., width or diameter of knob 0.055 mm., width of base 0.085 mm.

Young—(Figure 231 C). The first born are pale yellowish green without color markings at all and with transparently white antennae and legs. The older forms gradually assume the distinct dorsal markings either reddish or green with yellow spots until they have become as described under the adult forms. In some of these the style is pinkish instead of yellow.

Host—Found only on the upper surfaces of the tender, but most often on the older leaves of the common wild Cottonwood (*Populus trichocarpa* T. & G.). It is never a stem feeder. A great producer of honey-dew upon which grows great quantities of the black fungus. All infested trees are easily told by their dirty black appearance. The insect is able to cling to the surface of the leaves with a remarkable tenacity and it is almost impossible to jar or shake them off.

Locality—Obtained on cottonwoods growing along the Santa Clara River from Santa Paula to Sespe and along the Sespe River far up into the canyon at an altitude of 2000 feet.

Date of Collection—First taken in the Sespe Canyon May 20, where it occurred in great numbers on a single small tree. Again collected at Santa Paula August 4 and still shows up in considerable numbers at this date (Sept. 15, 1911). Serial number 16.

Symdobius macrostachyae n. sp.

WINGED VIVIPAROUS FEMALE (Figure 233 A)

Length of body 2.2 mm., width of the mesothorax 0.7 mm., width of the abdomen 0.9 mm., wing expansion 6 mm. *Body*—Medium in size, rounded, hairy. *Prevailing Color*—Black or very dark, shiny or dull. *Head*—Large, much wider than long, broad across the front between the antennae, hairy, very dark green to black with light transverse basal band. *Eyes*—Three large red ocelli on the dorsum of the head. Compound eyes large, red, with tubercles. *Antennae*—(Figure 233 C and D). Not on frontal tubercles, bases far apart, reaching to the third abdominal segment (a little more than half the length of the body), with long curved spines or hairs, three apical articles imbricated, articles I and II nearly as dark as the head, remaining articles amber brown to nearly black. Lengths of articles: I, 0.07 mm.; II, 0.07 mm.; III, 0.36 mm.; IV, 0.183 mm.; V, 0.173 mm.; VI, 0.26 mm. (base 0.13 mm., spur 0.13 mm.); total 1.116 mm. I and II usually subequal though the first is often longer and always wider, III is by far the longest article, being nearly twice as long as IV, more than twice as long as V, and more than twice as long as the spur of VI, IV longer than V, VI with base and spur equal in length, in not a few instances the spur is slightly the longest. The sensoria are large, circular, irregularly arranged, and situated as follows: About seventeen on III, usually two within the apical half of IV, one on V, and the usual ones at the base of the spur of VI. *Rostrum*—Reaches to, nearly to, or slightly beyond the tip of the abdomen, dusky yellow with dark base and tip. *Prothorax*—Considerably wider than the head, but not as

wide as long, with small semi-globular lateral tubercles near the base, black. *Meso- and Metathorax*—Dark brown with muscle lobes well developed and black. *Abdomen*—Little wider than the thorax, dark brown, amber, or nearly black, with amber or brownish markings on the dorsum, between the dark transverse bands, and amber around the bases of the cornicles, as well as along the sides. Dark markings along extreme margins, covered with rather long spines. Anal plate well rounded, hairy, dark. *Cornicles*—(Figure 233, 1). Short, widest at the base and constricted just below the mouth, which is flared, dusky amber to dusky green throughout, length 0.08 mm., width of base 0.09 mm., width of mouth 0.06 mm. *Legs*—Normally developed, very hairy, coxæ dark brown to nearly black,

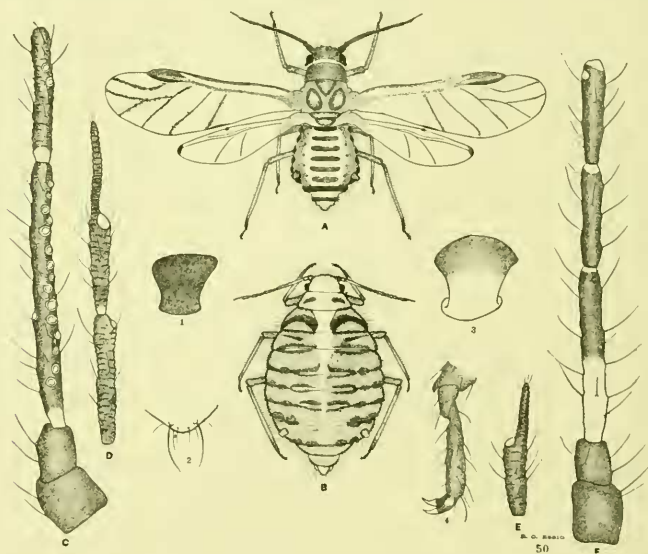


Figure 233. *Symdobius macrostachya* Essig

femora dark throughout, tibiae amber with dark bases and tips, tips with a sharp spur or point on the inner side, tarsi dark (Figure 233, 1). Article I composing about one-fifth of the entire tarsi, including the claws, hairy. *Wings*—Normally large and venation fairly constant. *Primary*—Length 2.7 mm., greatest width 0.9 mm. Veins slightly clouded, with a depression in the margin at the tip of the stigma. Costal vein wide and dark. Subcostal wider than the costal, amber to the stigma. Stigma short, oval with blind tip, dark with lighter streak which is a continuation of the subcostal vein, below this light area the color is darkest and the area is hairy, length 0.55 mm., width 0.18 mm. Stigmal vein arises near

the middle of the stigma, may or may not be sub-obsolete at the base, clouded darker near the base, curved throughout the basal half, slightly undulate, apical half nearly parallel with the upper branch of the second fork of the third discoidal, dusky amber. First discoidal arising beyond the middle of the subcostal, straight, often heavily clouded, more so than the other veins. Second discoidal with base nearer the first discoidal than the third discoidal, nearly straight with apical one-fourth curved inwardly, does not reach the wing margin, dusky amber with faint clouded borders. Third discoidal only slightly variable, normally twice-forked, with first fork about one-third distance from the base and the second fork half the distance from the first fork to the tip of the wing, the upper branch of the second fork longer than the lower, slightly clouded, dusky amber. In only a few cases is this vein once forked. *Secondary*—Length 1.8 mm., greatest width 0.5 mm., dark clouded area at the extreme tips, veins not clouded, venation normal with two discoidals. Subcostal vein strongly bent downward at the base of the second discoidal, which is below the hooklets; hooklets just beyond the middle of the upper wing margin. Discoidals with bases distant, one on either side of the middle of the subcostal, both obsolete for a very short distance at their bases, and both curve so that the convex surfaces are towards the wing tip, the second vein curved most, equal in length, do not touch lower margin of the wing. All veins dusky amber. *Style*—(Figure 233, 2). Very short and broadly conical, base three times as wide as the length, dark green, length 0.03 mm., width 0.09 mm.

APTEROUS VIVIPAROUS FEMALE (Figure 233 B)

Length 2.75 mm., width of abdomen 1.6 mm. *Body*—Well rounded and slightly plump, but not short, hairy, medium in size, dorsum with many lobes and depressions. *Prevailing Color*—Very dark brown, reddish brown with black markings or black with dull brown areas between the segments and along the middle dorsum, shiny or dull. *Head*, rather small, wider than long, hairy, dark reddish brown with dark margins or nearly black. *Antennae*—(Figure 233 E and F). About half as long as the body, bases distant, on the sides of the head, not on frontal tubercles, hairy, articles I and II dark amber or reddish brown, III with base yellow or amber and the remainder dark brown, IV, V and VI dark amber brown with lighter areas at their articulations. Lengths of articles: I, 0.077 mm.; II, 0.055 mm.; III, 0.236 mm.; IV, 0.14 mm.; V, 0.14 mm.; VI, 0.48 mm. (base 0.105 mm., spur 0.075 mm.). I is longer or equal to II in length, but wider, III is the longest article, being nearly twice as long as IV and V together, IV and V are subequal and each shorter than VI, but longer than the base, VI with base longer than the spur, though these are sometimes subequal. *Sensoria* on apical end of V and at the base of the spur on VI. *Rostrum*—Reaching to the middle of the abdomen, yellow with dark base and tip. *Prothorax*—Amber brown to dark brown with dark margins and amber middle, two depressions, one on each side, near the middle, two fleshy lateral lobes near the base. *Mesothorax*—Dark, nearly black, with middle amber or reddish brown area, sides distinctly lobed with curved depression in middle of each. *Mesothorax*—Short, nearly all dark, with amber or reddish middle, depressions on each side,

lateral tubercle on each margin. *Abdomen*—With six rather fleshy lateral tubercles on each margin, large depressions between the segments near the lateral margins, color dark, nearly black, with dorsal median line and slight area between segments dark reddish brown, and with a reddish band across the base of the last segment. *Cornicles*—(Figure 233, 3). Same shape as those in winged form, basal half color of the body, apical half yellow, length 0.115 mm., width of base 0.115 mm., width of mouth 0.08 mm. *Legs*—Front pair very short, and middle pair shorter than the hind pair, hairy, colored as in winged form. *Anal plate*—Rounded, dusky. *Style*—Short, broad at base, about three times as wide as the length, broadly conical, hairy, yellow, pinkish or amber, slightly dusky.

Young—Young of the apterous females are amber, reddish or dark brown with a lighter longitudinal band on the median dorsum occupying most of the head, one-third the width of the thorax and considerable of the abdomen, where it is the widest.

Host—Feeding only on the younger stems of the white willow, (*Salix macrostachya* Nutt.), and associated on the same twigs with the small green aphid, *Thomasia crucis*. It is not a leaf feeder at all, lives in dense colonies, and produces large quantities of honey dew, so that the infested trees are very black with smut. Usually found near the tips of the twigs and does not seem to feed upon the old bark at all. The apterous forms are very plentiful while winged individuals are scarce.

Locality—On low willow trees growing along the banks of the Santa Clara River in the vicinity of Santa Paula, Cal.

Date of Collection—August 25, 1911. Serial number 50.

This species resembles most *Chaitophorus nigrae* Oestl. (now a synonym of *Chaitophorus viminalis* Monell) in shape and general color, but differs from that insect as described by Prof. Oestlund in the following:

Chaitophorus nigrae Oestl.

Symdobius macrostachyae n. sp.

Antennae

Article IV a little shorter than V.

Article IV usually a little longer than V or subequal.

Base of VI about half as long as V.

Base of VI nearly as long as V.

VII (spur of VI) as long as IV.

The spur of VI nearly as little over half as long as IV.

Rostrum

Rostrum rather short, reaching second coxæ.

Rostrum long, nearly as long, as long or longer than to the tip of the abdomen.

Style

Style tubercle-like, or even knobbed as in *Callipterus*.

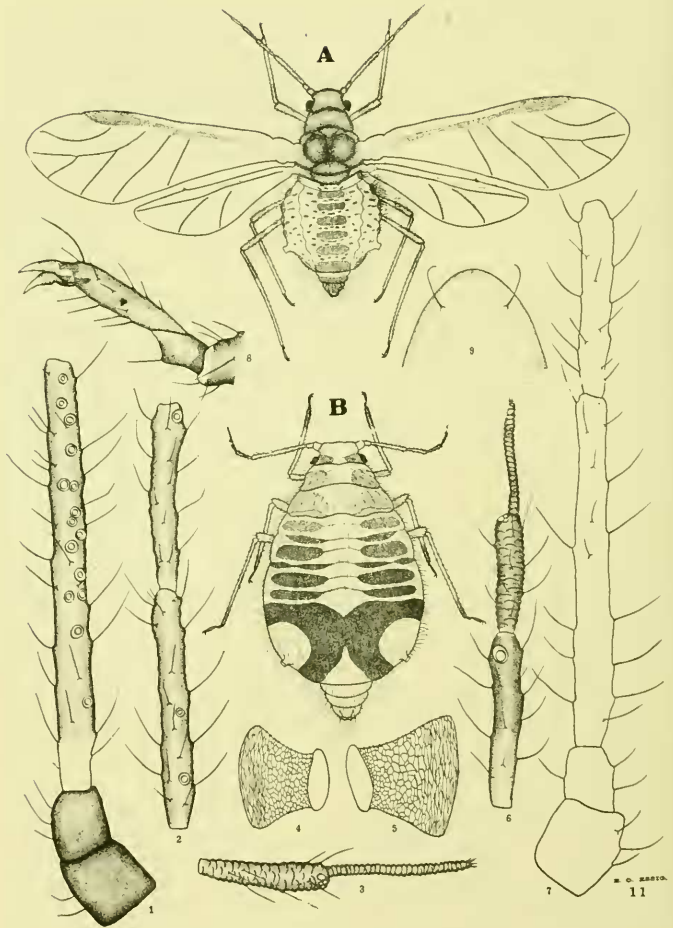
Style broadly conical and not knobbed as in *Callipterus*.

Symbobius salicicorticis n. sp.

(The Willow Bark Louse)

WINGED VIVIPAROUS FEMALE (Figure 234 A)

Length 2.4 mm., width of mesothorax 0.7 mm., width of the abdomen, 1.15 mm., wing expansion 7 mm. *Body*—Rather large, but considerably smaller than the apterous forms, wide and flat, covered entirely with long fine hairs which are situated on small tubercles. *Prevailing color*—Dark greenish brown. Outer slightly pruinose giving it the grayish color. *Head*—Nearly as long as wide, rounded in front, broad between the antennae, black, with indistinct frontal tubercles. *Eyes*—Large, with tubercles, dark red. *Antennae*—(Figure 234, 1 and 2). On very indistinct frontal tubercles, reaching to the middle of the abdomen (a little longer than half the length of the body), hairy, articles I and II dark, nearly as dark as the head, the remaining articles amber or light brown. Lengths of the articles: I, 0.08 mm.; II, 0.07 mm.; III, 0.48 mm.; IV, 0.265 mm.; V, 0.21 mm.; VI, 0.31 mm. (base 0.145 mm., spur 0.165 mm.); total 1.415 mm. I and II nearly coequal with the former, the largest and usually the longest, III is by far the longest article, being nearly twice as long as IV, more than twice as long as V and much longer than VI, IV is slightly longer than V, but shorter than VI. The spur and the base of VI are nearly coequal, though in the winged forms the spur is slightly the longer, imbricated throughout. The sensoria are all circular and vary greatly in size and distribution. On III they are scattered the entire length, varying in numbers from twelve to twenty, the average being sixteen or seventeen. On article IV there are from one to two, the first very near the base and the second near the middle. Out of ten average articles, six had one sensoria and four had two. There is but one near the apex of V and five small ones and a single large one on VI at the base of the spur. *Rostrum*—Reaches just beyond the middle of the abdomen, whitish-yellow with a dark tip. *Prothorax*—Without lateral tubercles, hairy, wider at base than at the apex, black. *Meso- and Meta-thorax*—Black, with muscle lobes well developed, hairy. *Abdomen*—Flat, wide, last two segments narrow and extended, brownish-green with large and small transverse black markings, as shown in the drawing, dark spots along the lateral margins, light around the bases of the cornicles. Ventral surface greenish. Anal plate extended, small, clouded green, hairy, rounded. *Cornicles*—(Figure 234, 4). Short, widest at the base, constricted just before the mouth, which is flaring very slightly, surface covered with fine network of lines forming a mosaic of long figures at the base and five or six-sided mosaic figures throughout the apical two-thirds, light yellowish green, length 0.08 mm., width of base 0.12 mm., width of mouth 0.07 mm. *Legs*—Rather slender, hairy, hind legs considerably longer than the first two pairs, coxae dark, femora with basal halves yellow and apical halves amber brown, tibiae amber brown with apical half yellowish, tarsi (Figure 234, 8) dusky yellow to dark amber brown; basal segment short and with prominent projection on lower side from which arises a spine, one-half as long as the second segment not including the claws. *Wings*—Normal, hyaline with all veins very faintly clouded. *Primary*—Length 3.2 mm., width 1.1 mm. Veins faintly clouded, dark brown, margin constricted at the tip of the stigma. Costal wide, brown.



Subcostal exceptionally wide, occupying the entire base of the wing, rich brown. Stigma short, oval, blunt at tip, lower margin as well as apical half of the subcostal with a row of short hairs, entirely brown and of a uniform color, length 0.6 mm., width 0.16 mm. Stigmal vein arising from the middle of the stigma evenly curved throughout its length except the extreme tip, which is curved slightly the opposite way. First discoidal arising from the middle of the subcostal vein, with slight curve near the tip so as to have convex surface towards the wing tip. Second discoidal arises nearly midway between the first and second discoidal, a little nearer the first, undulate, but may be nearly straight. Third discoidal twice forked and fairly constant, obsolete at the base, which is nearly midway between the bases of the second discoidal and the stigmal veins, first fork about one-third the distance from the base to the tip of the vein, second fork about half the distance from the first fork to the tip of the upper branch of the second fork, upper branch of second fork longer than the lower. *Secondary*—Length 1.9 mm., width 0.55 mm., with hooklets two-thirds the distance from the base to the tip of the upper margin. Subcostal vein slightly undulate with no strong curves, brown. Discoidals arising, one on each side of the middle of the subcostal, obsolete at the bases, both curved with convex surfaces towards the wing tip, the second vein with more slant towards the wing tip than the first. Veins brown and very faintly clouded. *Style*—Short, rounded or slightly conical, hairy, about as long as the cornicles, dusky green.

APTEROUS VIVIPAROUS FEMALE (Figure 234 B)

Length 3.2 mm., width of the abdomen 1.8 mm. *Body*—Decidedly wide and flat, covered with long fine light hairs, much larger than the winged individuals, naked if taken underground and pruinose if above. *Prevailing color*—Grayish to amber brown with darker brown markings, which may also be nearly black. A thin coating of white powder gives it the gray color. The ground color may vary from a light yellow, pink, or dark amber. *Head*—Nearly trapezoidal in shape with the base and front parallel, wide and flat between the antennae, with very short, indistinct frontal tubercles, reddish or yellowish brown to gray, with two darker spots near the base. *Eyes*—Small, with distinct tubercles, red. *Antennae* (Figure 234, 6 and 7). Not half as long as the body, on indistinct tubercles, hairy-hairs on tubercles; articles I and II concolorous with head, III and IV transparently yellow to whitish, V dusky yellow with dark amber apical one-half, VI dark amber brown throughout. Lengths of the articles: I, 0.09 mm.; II, 0.07 mm.; III, 0.4 mm.; IV, 0.22 mm.; V, 0.2 mm.; VI, 0.26 mm. (base 0.13 mm., spur 0.13 mm.); total 1.24 mm. The comparative lengths of the articles correspond well with those of the winged females. *Rostrum*—Reaches beyond the third coxæ, nearly to the middle of the abdomen, whitish with dark markings at the extreme tip only. *Thorax and Abdomen*—Ground color varying from whitish yellow, to rich yellow, amber, reddish brown to gray with distinct darker markings which may be rich dark yellow, brown or nearly black. These markings, usually darker shades of the ground color, are quite variable in extent. The drawing shows an average type. The median dorsum is usually yellow or lighter

from the front to the middle of the abdomen with faint cross-lines connecting darker transverse areas on both sides (usually a single area on the side of each segment) which do not usually extend to the lateral margins of the body, the posterior half of the abdomen is decidedly darker than the rest of the body with light areas surrounding the cornicles and a light pygidium. In not a few individuals this dark area extends forward, covering nearly all of the abdomen, but in such cases the light longitudinal median line is always distinct to the middle of the abdomen. The last two or three segments are extended and much narrower than the rest of the body. This extension is usually light, with dusky, small, anal plate at the tip. *Cornicles*—(Figure 234, 5). Of the same shape as those of the winged females, but larger, marked with mosaic lines, transparently white or yellow. Length 0.1 mm., width of base 0.14 mm., width of mouth 0.08 mm. *Legs*—Rather short and slender, first and second pairs very short, hairy, coxæ dark amber brown, femora dark amber brown, tibiae yellow with dark brown tips, tarsi brown. *Style*—(Figure 234, 9). Bluntly conical, smooth, short, width of base greater than the length, light yellow, with dusky margins, with very few hairs.

The adult insects move very rapidly and are active for a semi-underground form.

Young—The young vary from almost transparently white to yellow and dark amber, with or without dorsal markings.

Host—Found associated with *Fullawaya saliciradicis* at the surface of the ground, but mostly under ground feeding upon the bark of the Willow (*Salix laevigata* Bebb.). It collects in large colonies, some of which were found four inches under the surface of the sandy soil. The individuals collected underground are not so dark nor so distinctly marked as those taken near the surface. Both winged and apterous females were abundant and were being preyed upon by the larvæ of a red syrphid fly, which has not been determined.

Locality—Collected from the willow trees growing in the sand along the banks of the Santa Clara River in the vicinity of Santa Paula, Cal.

Date of Collection—August 16, 1911. Serial number 11.

This species somewhat resembles *Melanoxanthrium rufulus* (Davidson) in size and general color, but differs in habits and in generic characters as both descriptions show. Fearing that it might be *Melanoxanthrium saliceti* (Harris), specimens were sent to Mr. Davidson at San Jose, who has collected that species at Stanford University. His reply was that No. 11 compared favorably with William's *Chaitophorus bruneri*. Comparing it with this species we note the following differences:

| | |
|---|---|
| <i>Chaitophorus bruneri</i> Williams | <i>Symbobius salicicorticis</i> n. sp. |
| | <i>Color</i> |
| Green, light or very dark. | From a light yellow to amber brown, sometimes with greenish brown cast. |
| | <i>Cornicles</i> |
| In apterous form longer than broad. | In apterous form, the base is broader than the length. |
| In winged form, as long again as broad. | In winged form, the width of the base is much greater than the length. |

Hosts

Feeds on the leaves of *Populus tremuloides*.

Feeds on the bark of Willow (*Salix laevigata* Bebb.), and is a subterranean form, or nearly so.

Williams' description of the specific characters including the lengths of the antennal articles is deficient and a more extensive comparison is impossible. True that in many ways the descriptions agree very well, but from the differences given above and especially its habits, it seems to be a new species.

FULLAWAYA n. gen.

Type *F. saliciradicis* n. sp.

Body—Robust forms, the body of the winged female narrow at head, but mesothorax, metathorax and abdomen nearly the same width. The body of the apterous female widest at the middle and tapering to a point posteriorly and to a rather broad front anteriorly. Covered with short fine hair and may or may not be slightly pruinose. Large species.

Head—Considerably narrower than the thorax, slightly pointed or straight across the front, with very indistinct frontal tubercles, especially so in the apterous forms. Covered with fine hairs. Nearly quadrangular in shape with the antennae arising from the sides near the front.

Eyes—Large, with terete tubercles on the back margin.

Antennae—In the winged form a little over half the length of the body, not half so long as the body in the apterous form; not reaching beyond the third abdominal segment. Arising from the front sides of the head on very indistinct tubercles, or no tubercles at all. Covered with long hairs, each on a large tubercle. Slightly imbricated and rough because of the hair tubercles. Article I usually shorter than II, never longer than II, though they may be coequal, I always wider, III much longer than either IV or V, though not nearly so long as the two together, not so long as VI, but longer than the spur, IV and V nearly subequal, the former usually a little shorter; VI the longest article, the spur nearly twice as long as the base and nearly coequal with articles IV and V, but usually a little shorter than either. The transition from the base of VI to the spur is not so great as in most aphids, the spur is nearly as wide as the base.

Rostrum—Reaching nearly to the tip of the abdomen, to the tip or even beyond the tip (in the winged and young forms the rostrum may project beyond the tip of the abdomen), but in the robust apterous forms it does not quite reach to the tip. Hairy along margins of the last joint.

Prothorax—Wider than the head, nearly rectangular in shape, with large, semi-globular, lateral tubercles near the middle.

Abdomen—With lateral smaller semi-globular and rather pointed tubercles on each side. Practically all semi-globular in the apterous forms and two semi-globular ones near the middle on each side of the winged forms, the remainder rather pointed. Smooth, covered with fine hair, shiny or pruinose.

Cornicles—Entirely wanting.

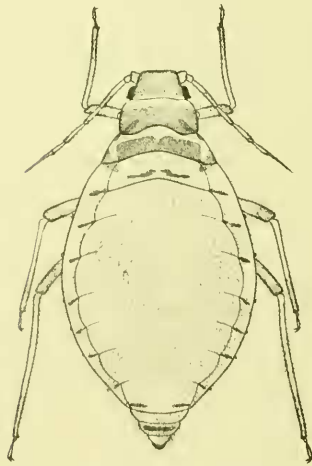
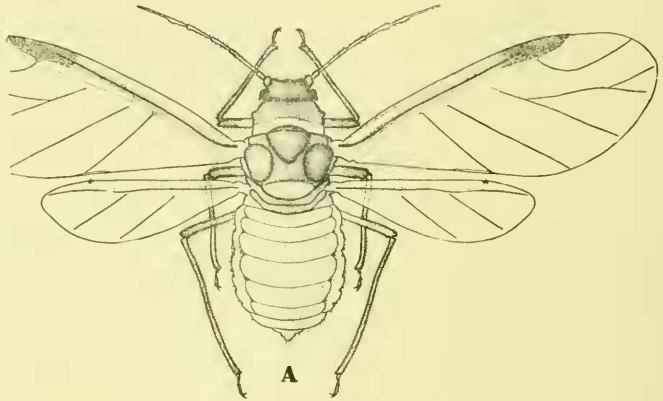


Figure 235. *Fullawaya saliciradicis* Essig

Legs—Larger, the first two pairs nearly of the same size, the hind pair much larger, hairy. Tibia slightly flared at the extreme base. First article of the tarsi very small and scarcely longer on the under side than the width.

Style—Broadly rounded, nearly semi-circular, hairy.

Anal Plate—Rather large and well developed, nearly semi-circular in form.

Wings—Short and broad, with venation fairly constant. Hyaline or dusky sub-hyaline. Stigma short and bluntly pointed at apex. Stigmatal vein arising near the middle of the stigma and deeply curved throughout the first half. First discoidal straight and normal. Second discoidal obsolete at base, straight. Third discoidal normally twice-forked, obsolete at base, first fork near the base and second fork near the apex of the wing. Secondary with two parallel discoidals.

This genus is widely separated from all other genera by its unique combination of distinct characters. It has the rostrum and legs of the genus *Lachnux*, the wing venation of *Chaitophorus* and the body resembles somewhat that of the genus *Aphis*, though there are no cornicles. In considering the antennae alone the insect might be placed in the tribe *Chaitophorini*, but a study of the individual articles excludes it from *Aretaphis* which has the spur of the sixth segment above five times as long as the segment. In *Chaitophorus* the spur of the sixth segment is about six times as long as the sixth segment and also longer than article III. In *Syndobius* the spur of the sixth segment is shorter than the segment. In *Thomasia* the spur of the sixth segment is shorter than the segment. From the description as given above it seems hardly worth while to make further comparisons with the genera which it most resembles. *Fullawaya* has not the antennae segmentation, stigma, or stigmatal vein of *Lachnux*, nor the specific characters of *Aphis*. Though a subterranean form it has neither the antennae nor the wing venation of any yet described. In consideration of these facts I have not hesitated to call it a new genus. With others this species was sent to W. M. Davidson of San Jose who writes as follows: "No. 20 is certainly a peculiar insect. I am very glad to have specimens of it. Very likely it is a new genus." The genus is named in honor of Mr. Fullaway, who has worked extensively on the Aphididae of Hawaii.

Fullawaya saliciradicis n. sp.

(Willow-Root Louse)

WINGED VIVIPAROUS FEMALE (Figure 235 A)

Length of body 3.2 mm., width of mesothorax 1.1 mm., width of the abdomen 1.35 mm., wing expansion 9 mm. A large and robust species. *Body*—Smooth, covered with fine hair and purulent throughout. *Prevailing color*—Black and silvery gray which is due to a heavy coating of fine powdery white wax. Some specimens are almost entirely destitute of any of this powder. *Head*—Nearly twice as wide as long, dull black, with very indistinct or no frontal antennal tubercles, fine hair on the front. *Eyes*—Dark red with distinct marginal tubercle. *Antennae*—(Figure 236, 8 and 9). On indistinct frontal tubercles, half or a little longer than half as long as the body, reaching to the base of the third abdominal segment; covered with long hair; color of segments: I and II

dusky amber, darker than any of the rest; III, IV, V and VI amber brown. Lengths of the articles: I, 0.12 mm.; II, 0.12 mm.; III, 0.46 mm.; IV, 0.38 mm.; V, 0.38 mm.; VI, 0.6 mm. (spur 0.36 mm.); total 2.06 mm. Sensoria are distributed as follows: from fourteen to sixteen large circular ones irregularly situated on III, thickest near the middle of the article, sensoria uneven in size; one large sensoria at apical end of V, and one large and six small ones in process of article VI. *Rostrum*—Very long reaching to or almost to the tip of the abdomen, yellow with dark tip, margins of tip hairy. *Prothorax*—Much wider than

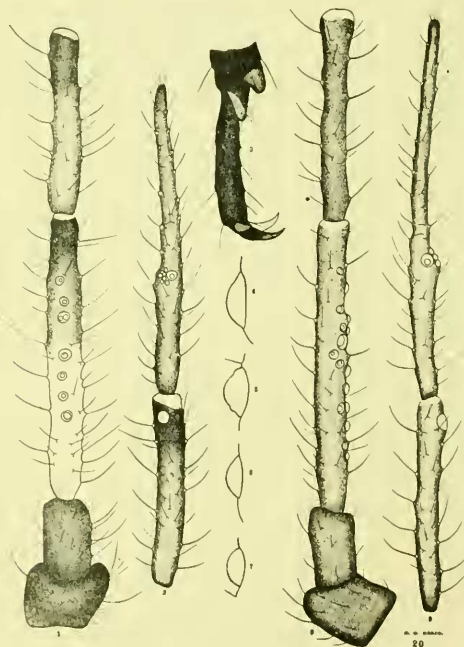


Figure 236. *Fullawayia saliciradicis* Essig

the head and nearly as wide as the mesothorax, with large oval lateral tubercle (Figure 236, 5) near the middle margin, very dark, almost black with brown side and lighter basal transverse band. *Meso-* and *Metathorax*—Dark reddish brown with muscle lobes, except scutellum, velvety black and covered with fine hair. Scutellum grayish brown, hairy. *Abdomen*—Thick, nearly the same width throughout and rounding off abruptly at posterior end, ground color reddish brown, amber or nearly flesh color, covered with fine white powder which is specially thick in the depressions between the segments, lateral margins with

pointed and rounded tubercles, those near the middle are rounded (Figure 236, 7) while those near the base and the pygidium or posterior end are more or less pointed as in many of the species of genus *Aphis*. In no other case have I ever seen these semi-globular tubercles on either the thorax or the abdomen; there is also a row of lateral marginal dark spots on each side near the base, or slightly behind the base, of each tubercle. Anal plate is rounded, hairy and dark. Ventral surface of the abdomen is same as the dorsal. *Cornicles*—Wanting. *Legs*—Rather long and very hairy, hind legs much longer than the rest; coxae amber, covered with powder. Femora, bases yellow with remainder amber brown, tibiae dark amber brown, tarsi (Figure 236, 3) dark amber brown, first article very short, ventral surface as long as the width. *Wings*—Rather shorter and wider than common, hyaline or dusky sub-hyaline. *Primary*—Length 4 mm., width 1.7 mm. Costal wide to the stigma, brown; subcostal wider than costal with vein area in middle distinct, brown; stigma short, oblong, nearly four times as long as wide, widest at base of stigma which is near the middle, rounds off to a blunt point near the apex, wing margin contracted at the apex of the stigma, dusky brown, length 0.85 mm., width 0.25 mm.; venation normal and fairly constant considering that this is a subterranean form; stigmal vein arising from the middle of the stigma sharply curved, downward and upward bend throughout the first half and nearly straight throughout the apical half, although there is a slight curve upwardly, brown, reaches the wing margin beyond half the distance from the stigma to the apex of the wing. First discoidal arises inside the middle half of the subcostal and is nearly straight, base connected to the subcostal by a dark or dusky area or an extension of the subcostal area, brown, sometimes curved slightly outwardly with the convex surface towards the body. Second discoidal obsolete at the base, straight, apex meets the wing margin midway between the apices of the first and third discoidals, brown, seldom even slightly curved. Third discoidal sometimes slightly variable, base obsolete, the third vein proper continuing to the wing margin in a direction nearly parallel to the second discoidal, though the apex gradually tapers towards the tip of the wing, in one instance this tip was forked thus making three forks in all (this is the only instance where this vein has been found forked), normally twice-forked, the first branch arising about one-third the distance from the base to the apex, this branch extends in almost a straight line towards the apex and does not branch until near the tip—about two-thirds its distance from the first fork, brown. *Secondary*—Length 2.5 mm., width 0.7 mm., subcostal vein distinct and with two downward curves, one at the base of each of the two discoidals, and with two upward curves, one between the discoidals, and one under the hooklets, basal half is bordered by a rather wide brown area not unlike that of the subcostal in the primary wings; discoidals are obsolete at the base and run parallel; first discoidal arises just within the basal half of the subcostal, and the second discoidal just outside the basal half of the subcostal vein; all veins brown. *Style*—Short rounded, concolorous with the body, hairy.

APTEROUS VIVIPAROUS FEMALE (Figure 235 B)

Length of body 4.5 mm., width of abdomen 2.25 mm. A larger form than the winged female with more robust body. *Body*—Smooth, even shiny, covered with fine soft hairs, often pruinose, especially if found near the surface of the soil—in some cases densely covered with fine white powder, widest at middle and tapering towards both ends. *Prevailing color*—From a yellowish white, to flesh, rose, or grayish or even silvery due to the covering. The forms taken from deep under ground are very light and almost colorless and always without the pruinose substance. *Head*—Gray or dusky, with broad straight front and little or no signs of antennal tubercles, nearly quadrangular in shape, wider than long, with narrow

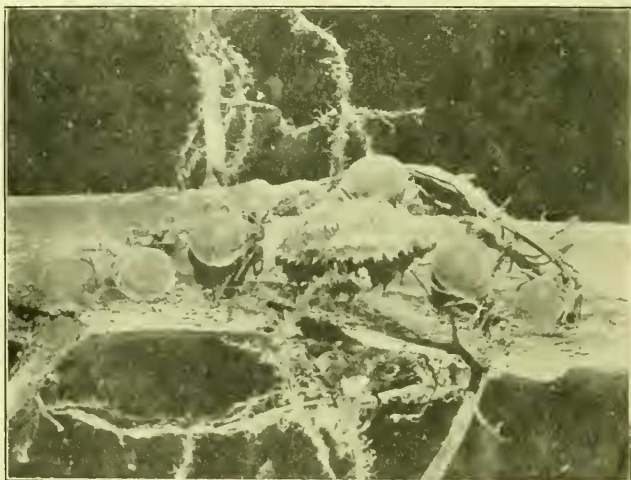


Figure 237. *Fullawaya salici-radici* Essig

On root of willow. Showing adult apterous viviparous females and a large horny larva of the red syrphid fly, which is the only natural enemy found preying on this aphid.

lighter band across the base. *Eyes*—Dark red, rather large, with tubercle. *Antennae*—(Figure 236, 1 and 2). Not half as long as the body, usually reaching to the middle of the second abdominal segment, hairy, the transition from the article VI to the spur very gradual; articles I and II dark gray, concolorous with head, III yellow with apical one-half amber, tip of segment distinctly constricted from last sensoria to the tip, IV, V and VI dusky amber with slightly darker tips. Lengths of the articles: I, 0.07 mm.; II, 0.13 mm.; III, 0.15 mm.; IV, 0.29 mm.; V, 0.30 mm.; VI, 0.19 mm. (spur 0.29 mm.); total 1.73 mm. Thus it will be seen that I is shorter than II, while in the winged form they were subequal; III is longer than IV or V but not so long as both together, neither is it

so long as all of VI, but is longer than the spur; IV is slightly shorter than V, but these are approximately subequal; VI is not so long as IV and V together, though much longer than either; the spur is not quite twice so long as the base and is not so long as the base and V together. On article III there is usually a single row of circular sensoria, usually from four to five, but often with but two and again with seven, as shown in the drawing; V has large sensorium near apical end and several (one large and six small) in the process of VI. *Rostrum*—Nearly as long as the body, and in the younger forms longer, color of the body or lighter with dark hairy tip. *Prothorax*—With rounded lateral tubercle (Figure 236, f), much wider than the head and about as wide, with light anterior portion and dull gray basal two-thirds, with lateral dark spot on each basal side. *Mesothorax*—Light at anterior end, one-third with dark lateral spot on each margin, with also a basal lateral dark blotch which extends on to the metathorax, and a large dark median basal blotch covering nearly the entire dorsum. *Metathorax*—With a continuation of the black blotch from the mesothorax and two median transverse dark bands near the basal border which do not touch in the middle. *Abdomen*—With a uniform pale color of from almost transparent white to a flesh, rose, gray or lead color, with a row of lateral dark spots at the union of the segments and a median dark band on the last segment and a dark-tipped style. Ventral surface of a uniform color such as the ground color of the dorsum, it is more liable to be pruinose. With large semi-globular lateral tubercles (Figure 236, f) as described in the winged form. Anal plate well rounded, dusky, hairy. *Cornicles*—Entirely wanting. *Legs*—Rather stout and hairy; coxae light yellow, pruinose; femora yellow with dusky tips; tibiae amber brown with dark brown tips; tarsi dark brown. *Style*—Short, rounded, dull grayish-brown, hairy.

Young—The young resemble the adult apterous females in color, being somewhat lighter.

Both the winged and apterous forms are rather slow and sluggish in their movements, but drop from the roots as soon as they are disturbed.

Host—Taken from the roots of the common Willow (*Salix laevigata* Bebb.), near the surface and as far as from fourteen inches under ground. They are found in light sandy soil along the river banks. It is a bark feeder and no forms were found above ground. They occur in rather large and compact colonies, but may also be very scattered (Figure 237).

Locality—Along the banks of the Santa Clara River, near Santa Paula, Cal.

Date of Collection—August 16, 1911. Apterous forms were fairly abundant, but the winged females scarce. Associated with another Aphid, No. 11. Serial number 20.

Thomasia crucis n. sp.

WINGED VIVIPAROUS FEMALE (Figure 238 A)

Length of body 1.2 mm., width of the mesothorax 0.35 mm., width of the abdomen 0.54 mm., wing expansion 3.84 mm. *Body*—Small, distinctly marked and colored, covered with long curved spines, flat, and rather short, but wide. *Prevailing color*—Rich green and black. *Head*—Large, rounded in front, nearly as long as wide, without antennal tubercles, dorsum very dark olive green to

black, ventral surface very dark, front hairy. *Eyes*—Large, with distinct tubercles, dark red. *Antennae*—(Figure 238, 1 and 2). Reaching to the base of the abdomen, slightly longer than half the length of the body, arising from the head just in front of the eyes, all except first two articles imbricated, covered with a few long spines. Articles I and II dusky yellow or amber, III light at base with amber or very dark apical four-fifths and the extreme tip darker, IV, V and VI dark throughout. Lengths of articles: I, 0.05 mm.; II, 0.045 mm.; III, 0.205 mm.; IV, 0.1 mm.; V, 0.08 mm.; VI, 0.21 mm. (base 0.07 mm., spur 0.14 mm.); total 0.69 mm. Articles I and II are often the same length, but the former is always much wider; III is not quite so long as VI, though very nearly so, but is much longer than the spur, IV is equal to or slightly longer than V, each of

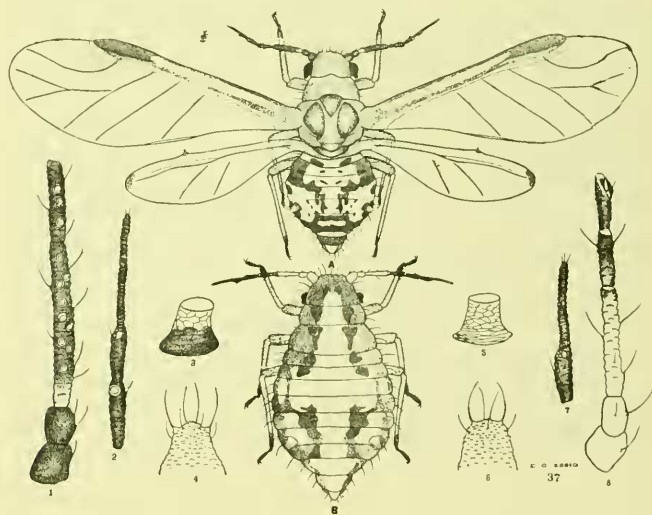


Figure 238. *Thomasia crucis* n. sp.

which is about half of III or VI. The sensoria are large and circular, being arranged irregularly on articles III, IV, V and in the process of VI as follows: from four to nine. Forty-four articles were examined and the following number of sensoria recorded: three had four, three had five, eleven had six, eight had seven, sixteen had eight, and three had nine, four had from one to three, sixteen were found with one, twenty-four with two, and six with three; V has from one to two—twenty-eight had one, and thirteen had two; article VI has the usual number (five to six) at the base of the spur. On III the sensoria are situated usually within the apical two-thirds; on IV there is usually one in the middle and the others within the apical one-half; on V there is usually one in the middle

and the other near the apical end. *Rostrum*—Reaches to the second coxæ, light-green with dusky tip. *Prothorax*—Without lateral tubercle, wide and short, hairy, dark green with lighter green transverse strip at apical border, ventral surface dusky green. *Mesothorax*—Dark green with muscle lobes black, or nearly so, ventral surface very dark with green area connecting the coxæ. *Meta-thorax*—Dark green with muscle lobes nearly black. *Abdomen*—Well rounded and flat, covered with long spines, light green with dark dorsal markings—there are three large distinct green areas, one on the middle dorsum at the base and one surrounding each cornicle, with lesser areas as shown in the drawing. Ventral surface light green. Anal plate well rounded or slightly depressed near the middle, dusky or light green. *Cornicles*—(Figure 238, 3). Short, base much wider than the mouth, gradually narrowing from base to the tip and smallest at mouth, which is not flared, covered with fine network of lines, basal half dusky, apical half green to yellowish, length 0.065 mm.; width at base 0.075 mm., width at mouth 0.04 mm. *Legs*—Short, stout, hairy, light, with coxæ dusky green, femora dark amber brown, tibiae light amber with dark bases and tips, tarsi dark brown. *Wings*—Rather long for so small an insect, narrow, hyaline, venation variable, but usually of the normal "Chaitophorus" type. *Primary*—(Figure 239, 1 to 11). Length 1.75 mm., width 0.63 mm. Costal vein wide to stigma, light amber to yellow; subcostal twice as wide as costal and of same color; first discoidal arises near the middle of the subcostal and is usually straight though in many cases it curves with the convex surface towards the tip of the wing (in one case this is reversed—right wing of pair 3); second and third discoidals with a tendency to unite at their bases (Figure 239, 6, 7, 10 and 11), though normally they are separated. Second discoidal curved or straight—when curved, with the convex surface towards wing tip, the base usually midway between the bases of the first and third discoidals, but a little nearer the latter, tip may show a tendency to fork as shown in 2, 5, 6 in Figure 239. In one instance (Figure 239, 2) there is a strange figure connecting the first and second discoidals; third discoidal very abnormal and variable as shown in the drawings. It may be once, twice or thrice forked. In the normal vein (if there be such) the first fork is just inside the middle and the second fork near the middle of the second branch. In not a few wings there are faint but distinct clouded borders along the stigmal and discoidal veins, darkest along first discoidal. Stigma short, oblong with blunt tip, margin of the wing is depressed or set in at the apex of the stigma, color dusky with basal margin lighter and hairy. Stigmal vein arising just beyond the middle of the stigma, mostly curved throughout the first half, slightly undulate, long, apical half nearly parallel with the upper branch of the second fork of the third discoidal. Tips of the veins often clouded. *Secondary*—Length 1.1 mm., width 0.31 mm., normally with two discoidals, though out of some fifty mounted specimens two wings were found without either discoidal, and five wings were found with only one discoidal and that the first one. Subcostal is always present and curved downward under the hooklets, reaches to tip of wing which has a dusky spot at its apex. First discoidal arising from the subcostal just inside its middle, straight, short, does not reach to the wing margin. Second

discoidal arises just outside the middle of the subcostal, obsolete, just a base, curves so as to have convex surface towards tip of wing, no longer than the first discoidal. All veins brown. *Style*—(Figure 238, 4). Short, wider at the base than at the apex, which is nearly straight across, rough, with long hairs or spines, green, length 0.07 mm., width at base 0.08 mm.

APTEROUS VIVIPAROUS FEMALE (Figure 238 B)

Length 1.3 mm., width of the abdomen 0.7 mm. *Body*—Flat, widest just in front of the cornicles, covered with long curved hairs or spines, well segmented, very small. *Prevailing color*—Rich green with a distinct light green or yellow cross on the dorsum (hence the name *crucis*), light spots or areas

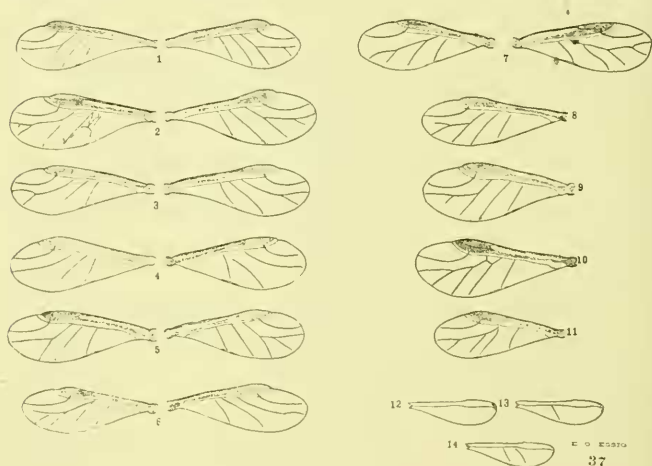


Figure 239. *Thomasia crucis* n. sp.

around the bases of the cornicles and a light posterior spot. The main axis of the cross extends in a longitudinal line on the dorsum from the base of the head to the end of the style, while the cross bar is a transverse band across the middle of the body. Surrounding the light area of the cross are dark green areas, which are darker than the rest of the body and which help to bring out the distinctness of the markings. Due to the smallness of this species the cross cannot be distinctly seen without the aid of a hand lens. *Head*—Large, considerably wider at the base than at the front, rounded between the antennae, which are far apart, covered with long hairs, dark green with median base lighter. *Eyes*—Large, dark red, distant from the bases of the antennae. *Antennae*—(Figure 238, 7 and 8). Reaching to the middle of the abdomen, slightly longer than half the length of the body, with few long hairs or spines, imbricated, light yellow with the tip

of III dusky amber, IV slightly dusky throughout with very dark tip, V and VI very dark throughout. Lengths of the articles: I, 0.05 mm.; II, 0.05 mm.; III, 0.138 mm.; IV, 0.07 mm.; V, 0.07 mm.; VI, 0.175 mm. (base 0.065 mm., spur 0.11 mm.); total 0.553 mm. Articles I and II usually equal in length, with the former much wider; III nearly twice as long as either IV or V, but not so long as VI, though shorter than the spur; IV and V coequal, and both short, each being but slightly longer than the base of VI; VI longer than III, the spur nearly twice as long as the base. Sensoria normal on V and in the process of VI. *Rostrum*—Reaching nearly to the third coxæ, green with amber base and dark tip. *Thorax*—Green with light yellow upper portion of the cross on the medium dorsum, ventral surface green. *Abdomen*—Green, the basal portion bearing the transverse bar of the yellow cross and the posterior portion bearing the lower main axis of the cross, a light spot at each end of the transverse bar, and light areas around the inner bases of the cornicles, covered with long curved spines. Ventral surface of a uniform dull green. Anal plate well developed and rounded, green. *Cornicles*—Light yellow or very light yellowish green, wider at the base than at the apex, not constricted before mouth, which is not flared, surface covered with a fine network of lines, which form a mosaic near the apex. Length 0.06 mm., width of base 0.07 mm., width of the mouth 0.04 mm. *Legs*—As in the winged forms. *Style*—(Figure 238, 6). Rounded at tip with sides nearly parallel, rough, spiny, little wider at the base than at the tip, green, length 0.07 mm., width of base 0.07 mm.

Young—The young vary from a light yellow to a light green, usually have dusky head, antennæ, tips of tarsi and tibia. The heads in the older individuals have a light dorsal, median line.

Host—This species has been observed feeding only on the undersides of the leaves of the White Willow (*Salix macrostachya* Nutt.), on which it collects in dense colonies and produces considerable smutting.

Locality—On the white willows growing along the banks of the Santa Clara River in the vicinity of Santa Paula, Cal.

Date of Collection—August 25, 1911. Serial number 37.

In general appearance this insect at first appears to be *Eichochaitophorus populifolii*, because of the light dorsal markings and the size, but as shown by the descriptions, is quite distant from that species. I know of no other species which is even near to the one just described.

SOME LEPIDOPTERA FROM MEXICO

HARRISON G. DYAR

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Prof. C. F. Baker has handed me for identification a lot of *Lepidoptera*, taken in Mexico by Messrs. McConnell and D. L. Crawford. The following species are represented:

NYMPHALIDAE

Phyciodes elada Hewitson, two ♂♂, Guadalajara (McConnell).

LYCAENIDAE

Lycaena marina Reakirt, one ♂, Guadalajara (McConnell).

SYNTOMIDAE

Chrysocale principalis Walker, two ♀♀, Oaxaca (Crawford).

Syntomeida melanthus Cramer, one ♀, Vera Cruz (Crawford).

Dinia aegrus Cramer, two ♂♂, Tapachula, Chiapas and Vera Cruz (Crawford).

Sphecosoma cognata Walker, one ♂, one ♀, Vera Cruz (Crawford).

Isanthrene perboscei Guerin, one ♀, Jalapa (Crawford).

LITHOSIIDAE

Ptychogene haematodes, n. s.

Black; forewing with a large crimson patch, occupying most of the wing, leaving a very narrow black costal edge, a broader inner margin and a rather wide outer margin, which is oblique, widening toward tornus; the patch varies in size in the individuals, in some extending down only to submedian fold, in others to vein one or below; the outer margin is a little indented at about vein four. Hind wing with a broad costal ray, not attaining apex, nor crossing cell.

Seven specimens, mountains near Cuernavaca (Crawford); Popocatepetl Park, 8000 feet, June, 1906 (W. Schaus); Salazar, 10,000 feet (W. Schaus).

Type No. 14429, U. S. National Museum.

Nearest to *P. erythrophora* Felder, but the red patch much larger.

ARCTIIDAE

Apantesis proxima Guerin, one ♀, Vera Cruz (Crawford).

NOCTUIDAE

Chloridea obsoleta Fabricius, one ♂, Cuernavaca (Crawford).

Eupanychis mexicana Hampson, one ♀, Cuernavaca (Crawford).

Prorachia daria Druce, one ♂, one ♀, Cuernavaca (Crawford).

Oxycnemis mexicana Dyar, one ♀, Cuernavaca (Crawford).

Pleonecptytera cuernavacalis, n. s.

Brown, not reddish; lines pale, even, the outer a little bent over cell, marked on the costa with blackish shades; reniform present, dark brown filled; sub-terminal line irregular, powdery, dotted, with a rounded black cloud at veins 3-4.

Hind wing more grayish but dark, whitish only on the disk, with a faint dark discal mark and an outer mesial pale line. Abdomen with a lateral tuft of black hair near base. Expanse, 23 mm.

Male, Cuernavaca (Crawford).

Type No. 14430, U. S. National Museum.

The species resembles *P. cumulalis* Dyar, but the subterminal line is broken powdery and indistinct.

Yrias prophronis, n. s.

Dark, lustrous, violaceous brown; lines black; inner irregularly flexuous; reniform upright, narrow; outer line excurved over cell and inward to near origin of vein two, then to inner margin with a slight out-curve; subterminal lines wavy, pale. In the male, the tint is light violaceous, the subterminal line slightly relieved. The hind wings in this sex have three nearly straight black lines across the middle and a subterminal light macular one; a crenulate terminal black line on both wings. In the female the color is darker, more irrorate with blackish; a dark shade occupies the space between the outer and subterminal lines, the latter being rather distinctly relieved. The hind wing is also more darkly shaded than in the male, only the outer of the three median lines distinct, while the subterminal punctiform line has a crenulate black inner edging. Expanse 24 mm.

Two males, one female, Cuernavaca (Crawford).

Type No. 14431, U. S. National Museum.

Near to *Y. repentis* Grote, but the outer line is less indented and angled, while the sexual dimorphism is rather pronounced.

PYRALIDAE

Glyphodes quadristigmalis Guenée, one ♂, two ♀♀, Cuernavaca (Crawford).

Glyphodes infimalis modialis, n. subs.

Like *G. infimalis* Guenée in markings, but larger and of more robust build. Expanse 25 mm.

One male, Cuernavaca (Crawford). ♂ - ♀

Type No. 14433, U. S. National Museum.

Loxostege autocratoralis, n. s.

Fore wing yellow, the costa yellow-brown; inner line nearly perpendicular to costa, a little curved; orbicular and reniform brown, solid; outer line excurved over cell to vein two, then perpendicular to inner margin; subterminal line brown, slender, close to the brown-shaded margin. Hind wing subhyaline whitish, shaded with yellow; a brown line on the disk, slightly crenulate over the nervules, stopping below vein two, where it is sharply bent upward; a brown marginal band, the fringe more reddish brown. Expanse 20 mm.

One female, Cuernavaca (Crawford).

Type No. 14432, U. S. National Museum.

Near *L. mancalis* Lederer, but the markings more distinct, the subterminal line narrow and close to the margin.

ZYGAENIDAE

Gingla phonicoruma, n. s.

Black; abdomen crimson except the basal and last two segments. The wings are without markings; fore wing with veins 7-8 stalked; hind wing with veins six and seven separated, vein eight with a long oblique cross-bar to end of cell. Expanse 16 mm.

One female, mountains near Cuernavaca (Crawford).

Type No. 14434, U. S. National Museum.

SESIIDAE

Four specimens, too much injured for identification.

GELECHIIDAE

Avacampsis, n. s.

Cuernavaca (Crawford). The specimen has been turned over to Mr. August Busck, to be described later in another connection.

STUDIES IN ACARINA III

H. V. M. HALL

POMONA COLLEGE, CLAREMONT, CAL.

Notaspis pectinata n. sp.

(Figure 240)

Length 750 to 865 micm. Yellow brown, smooth, polished. Abdomen hemispherical, without wings. Cephalothorax broader than long. Lamellae slight ridges converging in front where they are united by a translamellar line about as long as the lamellae. The cusps are reduced to mere tubercles. Lamellar, interlamellar and rostral hairs long, stout and pectinate, the rostral hairs being less than half as long as the others. Pseudostigmatic organ pectinate, with rather

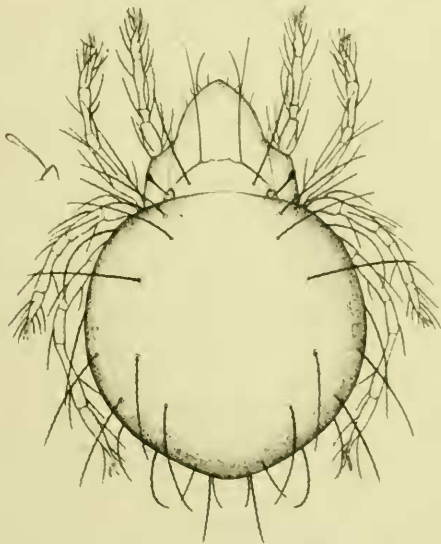


Figure 240. *Notaspis pectinata* n. sp.

long peduncle and very gradually clavate head. Abdomen with two rows of stout pectinate hairs on each side, similar to the interlamellar hairs. Legs not quite so long as abdomen, sparsely set with pectinate hairs similar to the rostral hairs. Unguis tridactile, last three pairs of legs inserted at the edge of the body. No blades apparent on femora. Several specimens under boards, Claremont, Cal.

This species is almost identical with Pergande's figure of *Eremacus pilosus* in Bank's "Treatise." My specimens lack the simple bristle on the apex of the penultimate joints of the legs, and the body is slightly broader. Michael's key places this species as a *Notaspis*, close to *N. serrata*. The species *E. pilosus* is referred to by Banks in his Catalogue to his description of *Scutovertex pilosus*

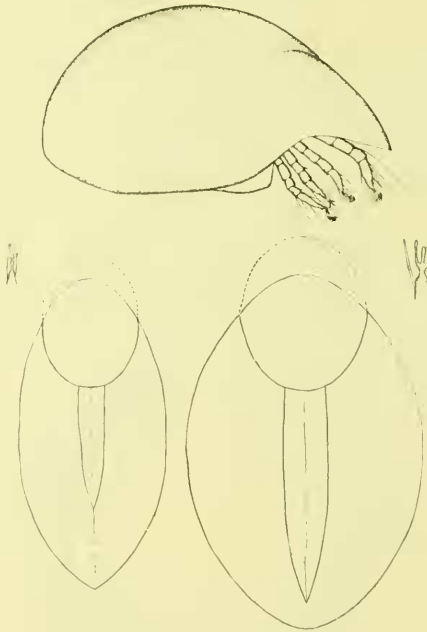


Figure 241. *Phthiracarus retalticus* (on left); *Phthiracarus contractilis* (on right); *Phthiracarus retalticus* (side view, above).

in Trans. Amer. Ent. Soc. XXII, p. 11, which as Michael remarks is "apparently not a *Scutovertex*, probably a *Notaspis* (said to be so by Banks, in litera)."

I also present the following illustrations of mites which I have identified as:

Phthiracarus retalticus (Stoll)

(Figure 241)

This species was described from Guatemala. My specimens were found under drift-wood on salt marsh, Pawson Park, Conn., during August. The length of my specimens (from tip of abdomen to dorsal suture) is 685 micrm.

Phthiracarus contractilis (Perty)

(Figure 241)

This species was described from decayed wood in Germany. My specimens were found under drift-wood on salt marsh, Pawson Park, Conn., in August. Length of my specimens is 838 microm. to 1 mm. (measured from tip of abdomen to dorsal suture). The side view is identical with *P. retalticus*. Differs from that species as shown in figures by rounded tip of abdomen and different form of unguis as shown in the corresponding small figures. The ventral views, with cephalothorax closed down are shown, while the position of the cephalothorax when open is indicated by the dotted line.



Figure 242. *Rhizoglyphus longitarsus* var. *californicus* n. var.

Rhizoglyphus longitarsus var. *californicus* n. var.

(Figure 242)

Differs from the species as described by Banks in the following particulars:

The bristle at the tip of the penultimate joint is not as long as the tarsus. The two spines on the hind tarsus are proximal to the middle of that joint. Length of my specimen, a male, .7 mm. Tarsus I in my specimen is much longer and thinner than that illustrated by Banks in Bulletin 13. Tarsus I also has a curved spine at the tip which is almost as large as the claw.

Sent from Banning, Cal., where a colony was injuring the bark of an apple tree.

DIARTHROMYIA CALIFORNICA n. sp.
(Diptera, Itonidæ)

DR. E. P. FELT

STATE ENTOMOLOGIST, ALBANY, NEW YORK

The species described below was reared by Mr. C. F. Stahl, March 12, 1912, from galls on *Artemisia californica*, at Claremont, Cal. This species is most easily separated from *D. artemisiae* Felt, by the smaller number of antennal segments.

Gall—Length 1.5 mm., diameter .5 mm. A brownish or reddish, sub-conical, thin-walled growth protruding at an oblique angle from the under side of the narrow leaflets. The slender, darker tip of this monothalamous gall is pushed off by the escaping midge.

Male—Length 1.25 mm. Antennæ nearly as long as the body, sparsely haired, fuscous yellowish; fourteen segments, the fifth with a stem three-fourths the length of the cylindric basal enlargement, which latter has a length nearly twice its diameter; terminal segment reduced, obtuse. Palpi probably biarticulate. Mesonotum reddish brown. Scutellum yellowish red, postscutellum fuscous. Abdomen yellowish. Wings hyaline, costa light straw. Halteres probably pale yellowish. Coxæ and legs apparently fuscous yellowish, the claws slender, unidentate, the pulvilli shorter than the claws. Genitalia; basal clasp segment stout; terminal clasp segment short, greatly swollen; dorsal plate short, deeply and roundly emarginate, the lobes broadly rounded; ventral plate short, broadly and roundly emarginate, the lobes narrowly rounded.

Female—Length 1.5 mm. Antennæ extending to the base of the abdomen, sparsely haired, yellowish; fourteen subsessile segments, the fifth with a length nearly twice its diameter; terminal segments slightly produced, tapering. Color characters nearly as in the male, except that the abdomen is deep reddish, the ovipositor nearly as long as the body, being yellowish; terminal lobes narrowly oval, with a length nearly twice the width. Type Cecid a2269.

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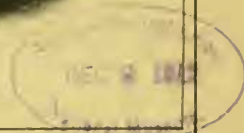
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THE GALL MIDGE FAUNA OF WESTERN NORTH AMERICA

E. P. FELT, ALBANY, N. Y.

The following list summarizes our knowledge of the gall midges in the western half of North America and should be of service in directing the efforts of future investigators. There are in the Lestremiinae, no representatives of the genus *Catocha*, *Neptunimyia* and *Neocatocha*, while the five American genera referable to the Heteropezinae are remarkable for their absence from the list. Investigation in the eastern United States shows that *Miastor*, with its peculiar pedogenetic larva, is widely distributed, and it and its allies should be found in the moister wooded areas of the west. There are eight American genera of *Epidosariae* known, only three represented by four species having been recorded from the west. The oak flora must support a characteristic *Cincticornia* fauna, yet none have been recorded, while the allied *Schizomyia* is represented by only one species. The prolific and varied *Itonidinarinae* are represented by relatively few species. The list is longer than we anticipated, yet it must be considered as only an introduction to what systematic collecting will disclose.

LESTREMIINAE

- Lestremia barberi* Felt, New Mexico.
- L. kansensis* Felt, Kansas.
- L. dyari* Felt, Kaslo, B. C.
- L. vernalis* Felt, Kansas.
- Microcerata cockerilli* Felt, New Mexico.
- M. spinosa* Felt, Texas.
- M. texana* Felt, Texas.
- Joanissia neomexicana* Felt, New Mexico.
- Mycophila fungicola* Felt, reared from mushrooms, California.
- Campylomyza texana* Felt, Texas and Colorado.
- Prionellus silvana* Felt, Kokanee Mountain, B. C.
- P. moullis* Felt, Texas.
- P. simulator* Felt, Kaslo, B. C.
- P. boulderensis* Felt, Colorado, Oregon.
- P. montana* Felt, Colorado.
- Monardia tuckeri* Felt, Texas.
- Cordylomyia brevicornis* Felt, Kaslo, B. C.